RAILROAD GAZETTE

SATURDAY, AUGUST 23, 1873.

Hydraulic Forging.

The accompanying cuts, which, with the description, are taken from *Engineering*, illustrate the method of hydraulic forging in use at the works of the Austrian State Railway Company in Vienna, which was devised by Mr. J. Haswell:

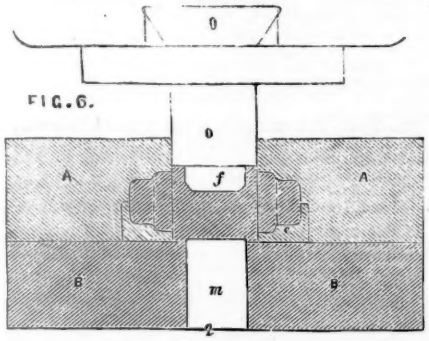
Broadly speaking, Mr. Haswell's system of forging consists in placing blooms, heated to a good welding heat, between dies or matrices, and subjecting them to an enormous hydraulic pressure. Under the influence of this pressure the plastic iron flows into the recesses of the mould, filling them perfectly, and by this system Mr. Haswell is enabled to produce at a moderate cost most complex forms, which, if forged by hand, would be extravagantly costly.

The hydraulic forging machine at present in use at the works consists of a strong base plate, or anvil block, connected by four wrought-iron columns with an over head cylinder 19 Austrian (19 11-16 English) inches in diameter. The cylinder is of cast iron, strengthened with wrought-iron hoops, and at the top is a "drawback" cylinder, 5 inches diameter, the plunger of which is connected by cross-heads and side-rods with the plunger of the main cylinder. The small plunger has the water pressure constantly against it, and consequently rises when the water is released from the large cylinder, carrying with it the large plunger to which it is attached.

The upper matrix is fixed to the lower end of the large plunger, while the lower matrix is carried upon a small four-wheeled trolly, which runs on rails laid so as to pass between the columns of the press. The platform of the trolly on which the lower mould rests lies between the carrying axles, and is connected to the latter by springs, these springs being of such strength that the platform when loaded with the mould is carried a short distance clear of the rails. This being the case, the trolly can be traversed freely; but when in position under the press, the pressure of the plunger on the bloom placed on the lower mould further deflects the springs, and the platform then takes a solid bearing on the bed-plate, the strain put upon the axles of the trolly being merely due to the extra deflection of the springs. The trolly is made long enough to hold two moulds, if necessary, so that one may be used while the other is cooling, and the whole arrangement is a most convenient one.

The water is supplied to the press at a pressure of three tons per square inch by a horizontal pumping-engine close by, this engine having its steam cylinder placed at the center of the bed-plate, and the piston rod extending out through the two

FIG. 6.



covers and forming the plungers of a pair of pumps fixed one at each end of the bed-plate. The side valve of the steam cylinder just mentioned is moved by a piston working in a small auxiliary cylinder, the slide valve of this latter cylinder being in its turn moved at the end of each stroke of the last piston by arms connected to the rod of the latter coming into contact with stops on the small valve spindle. There are no safety valves on the hydraulic pipes, and the pumping engine moves just as the water is required by the press, being stopped by the resistance opposed to the plunger of the latter when the moulds have been forced home. The steam pressure used is 80 lbs. per square inch.

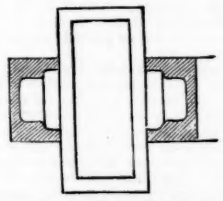
In working the press the plunger with the upper mould is allowed to fall on the bloom by the action of gravity alone, the cylinder filling with water (from an overhead tank) as the plunger falls. As soon as the plunger is in contact with the bloom, however, the water under pressure is turned into the cylinder, and all other water required to cause the descent of the plunger is forced in by the pumps. The opening and closing of the valves for admitting water to, or releasing it from the hydraulic cylinder, is effected by moving by hand the slide valve of one or the other of two small steam cylinders, the pistons of which are connected to levers for moving the hydraulic valves. The sudden opening or closing of these valves is prevented by their levers being connected to perforated pistons moving in cylinders filled with oil.

It will be seen that, allowing for the reduction of effective area due to the action of the drawback cylinder, the press, of which we have just been speaking, is capable of exerting a pressure of 848 tons, or, making a liberal allowance for friction of cup leathers, &c., say 800 tons. With this pressure at his command Mr. Haswell is enabled to forge outside cranks, pistons, axle boxes, eccentrics (a pair of eccentrics being forged solid in one piece), straps for connecting rods, spring buckles, expansion links, and an immense variety of other details, many of them of very complex form, while besides he employs the press for "cogging" or drawing down steel ingots—work which it performs in excellent style—and other similar operations. Recently, too, Mr. Haswell has commenced forging his wrought-iron wheels in segments under this press.

To explain more clearly the process we describe here the method of stamping a spring band having pins projecting from its sides as shown in figure 7, annexed. The piles from which these buckles are forged are made of selected scrap. The pile is first forged under a two-ton steam hammer, and the bloom produced is cut into eight equal parts, of 84 pounds each, each of which forms one band. The parts are then put into a reheating furnace and brought up to a good welding heat, ready for stamping. The stamping is performed by the aid of two cast-iron moulds, *A* and *B*, of the shape shown in the accompanying sketches, figures 6 and 7. The lower mould, *B*, is a flat cast-iron slab, having in its center a hole containing the block *m*, the lower end of which rests on the platform *q*. The block *m* corresponds in shape to the opening in the spring band, but is rather larger, its width, for instance, being 3.5 inches, while the width of the opening in the band is 3.33 inches. The upper mould, *B*, has also a hole in its center, the outline of this hole corresponding with the exterior of the spring-band, while recesses are also formed corresponding to the shape of one-half of the side pins or studs on the spring band. The other half of these pins is formed in loose pieces, *e*, fitted to the upper mould, as shown in figure 6, these pieces being easily withdrawn to enable the finished forging to be removed.

The two halves of the mould being arranged as shown, the iron, at a good welding heat, is dropped into the opening in the upper mould, and the punch *o* is then forced down by the hydraulic press. The punch *o* has a projection, *f*, formed on its end to assist in spreading the iron so as to properly fill the recesses in the

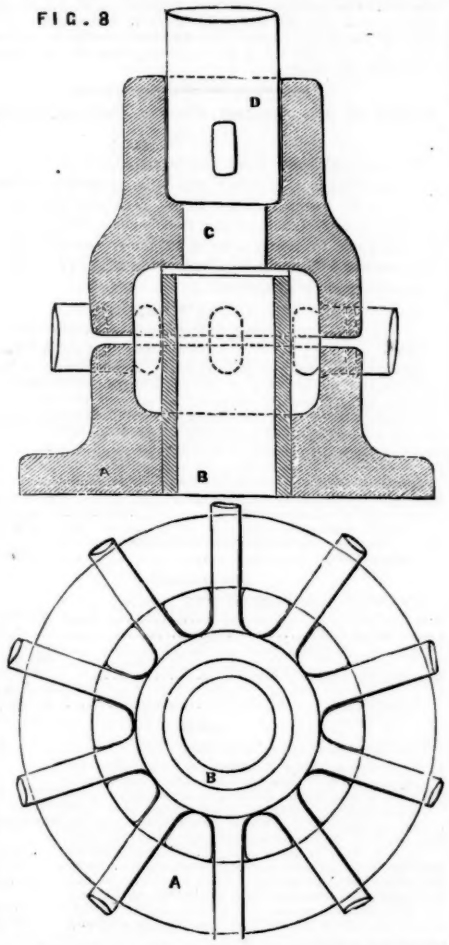
FIG. 7



mould and form the pins. This projection *f* also serves to form a cavity for receiving and guiding the end of the punch subsequently used. The iron having been pressed and caused to flow into the cavities in the mould, as shown in figure 6, the ram is raised again, and the plug, *m*, removed. A loose punch, of a size and shape corresponding with the opening in the spring buckle, is then inserted and forced through by a second descent of the ram of the press, thus finishing the forging. In this way from thirty to fifty buckles can be stamped by the press in a day of ten hours. Plain spring buckles, without side studs, are produced in a similar way, but in this case the mould is more simple, there being no loose pieces, *e*, and, owing to this, the rate of production is much more rapid, the press turning out from 100 to 120 pieces in ten hours.

In addition to the press now in use at the works of the State Railway Company, Mr. Haswell is now erecting another of still

FIG. 8



larger dimensions. This new press has a ram two Austrian feet (=24⅞ in. English) in diameter, the cylinder being of cast iron with a thick steel liner. The general arrangement of the new press is similar to that of the one now in use, but several improvements have been made in details, and the construction generally is more massive, so that the machine will be fit for exceedingly heavy work. As in the old press, the water will be supplied at a pressure of three tons per square inch, and we may mention that the supply pipes connecting the press with the pump have been made by boring out solid Bessemer steel bars, none of the wrought-iron pipes obtainable of the required diameter being found capable of satisfactorily withstanding the pressure. In speaking of the press at present in use, we mentioned that to avoid waste of power the water required to fill the cylinder after the ram had dropped by the force of gravity was supplied from an overhead tank, and only after the cylinder has been thus filled is water forced in by the pumps. In the case of the new press an overhead tank could not conveniently be provided, but the difficulty has been got over by Mr. Haswell in the following way: Instead of allowing the water to escape freely from the cylinder of the press during the upstroke, it is discharged into a cast-iron vessel fitted with an escape valve loaded to a few pounds' pressure above the atmosphere, this pressure being sufficient to overcome the head of water due to the difference of level of the press cylinder and the vessel to which the valve is fitted. When the press plunger falls by gravity, the pressure existing in the vessel just mentioned causes the water to flow back into the cylinder, filling the latter and placing it in the same condition as if it was fed from an overhead tank. The pumps also draw from the vessel of which we have been speaking, and provision is made for replacing any water lost by leakage. By the side of the new press a steam hammer suitable for the preliminary treatment of the blooms has been erected, and when the new plant is fairly at work, the old press will be removed from its present position, and, with another steam hammer, will be erected in the same shop, which will then contain the finest plant in existence for the production of complex forgings. We may mention that Mr. Haswell makes his steam-hammer foundations of concrete, the anvil blocks resting directly on the concrete, without the interposition of any timber.

The leading feature of the system of forging wrought-iron wheels now used at the works of the Austrian State Railway Company consists in the bosses being formed by welding up the inner end of the spokes only, no washers being welded on at the sides to make up the thickness of the bars, as is the usual practice. The operation of welding up the boss is performed in the following way: The spokes having been built up into a wheel as usual, and secured by a hoop placed round them, a welding heat is taken on their inner ends, and the boss is then laid in a die formed as shown at *A*, in the annexed sketch, fig. 8. This die is hollowed to fit the boss, and its rim is notched out to receive the spokes, the remaining portions of the rim forming, as it were, a series of fingers which reach up between the spokes and prevent the spreading of the boss outward. Next a mandril, *B*, is dropped into the hole in the boss, and then the upper die, *C*, which is of a similar form to the lower die, *A*, is forced down by the pressure of 80 pounds of steam on the upper side of a piston about 3ft. 6in. in diameter, working in an overhead steam cylinder. The upper die, *C*, is attached to the piston rod, *D*, by a loosely fitting cotter, *E*, and after the die has been forced down as described, the cotter is withdrawn, the piston raised, and then made to perform a quick down-stroke, the piston rod then acting as a ram, and giving a sharp blow to the upper die.

It is stated that the welding of the boss effected in this manner is perfectly sound and that few or none of the wheels when bored or turned show any signs of a faulty weld. At present the spokes for the wheels are for the most part stamped separately in the hydraulic forging press; but Mr. Haswell is now introducing another mode of manufacture, which he intends to adopt almost exclusively as soon as the new and more powerful forging press is at work. According to this plan, instead of each spoke being forged separately, the wheels are made in segments, each segment consisting of two spokes with the corresponding portions of the boss and rim as shown in the annexed sketch fig. 9. These segments are stamped out in one solid piece in the hydraulic forging press, and they are built up and treated just as the separate spokes are at present. With the segments, however, the number of welds in the rim and boss is reduced to one-half, and all welds between the spokes and rim are done away with. Mr. Haswell is already successfully stamping out segments of this kind in the existing forging press, and altogether this mode of constructing wheels is one which promises to give exceedingly good results.

As connected with this subject, we may mention here an arrangement which Mr. Haswell has adopted for enabling his presses to be worked with a boiler of moderate dimensions. Naturally, in an arrangement of this kind the demand for steam

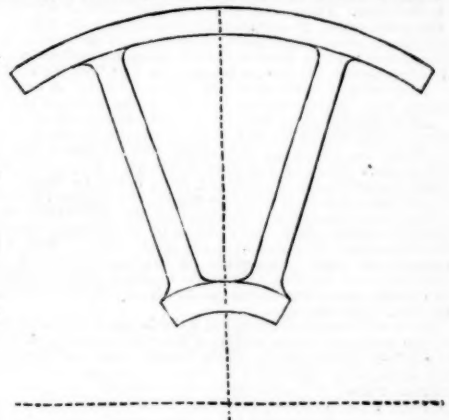


FIG. 9.

is very unequal; and when a press is employed for drawing down steel ingots, there is especially a large demand during the time a bloom is being treated. To meet this demand Mr. Haswell employs a boiler of the locomotive type, but places above it a second barrel about 4 feet in diameter, this barrel being connected to the boiler proper by large vertical tubes. Before the cogging or drawing down of a steel ingot commences, the feed water is pumped up so that it not only fills the boiler proper, but also a considerable portion of the upper barrel; but as soon as the press is set to work the feed is shut off, and the water level is allowed to work down. On an ingot being finished, the water is pumped up again, and so on. The large quantity of heated water thus stored in the boiler at the commencement of a cogging operation may be said to occupy the place of a fly-wheel in a rolling mill, acting as a reservoir of power, and tending to reduce the work to be done by the boiler to an average quantity.

Erie Railway Specifications for Iron Bridges.

The Erie Railway Company has recently invited proposals for the construction of a large number of iron bridges. The following are the specifications:

LOADS.

Bridges are to be proportioned for the following weights, in addition to the weight of iron in the trusses and iron floor beams:

For a floor weighing 400 pounds to the lineal foot for each track.

For a moving load varying from 1,500 to 3,500 pounds for each lineal foot of truss, according to the following table, these weights being by the foot of each truss and not of each track.

LENGTH OF SPAN.	Each truss of single track bridges and double track bridges of 3 trusses	Each truss of 2 trusses double track through bridges and center truss of 3 truss double track through bridges	Each truss of 2 trusses double track deck bridges	Each truss of 3 truss double track deck bridges
Fifty feet and under	2,000	3,500	4,000	2,500
Over 50 and not over 100 ft.	1,750	3,000	3,500	2,250
Over 100 and not over 150 ft.	1,500	2,750	3,000	2,000
Over 150 and not over 200 ft.	1,500	2,500	2,750	1,750

Strain sheets are to be furnished for the examination of the Engineer of the Erie Railway Company.

BOILER-PLATE GIRDERS.

Boiler-plate girders will generally be used for spans of fifty

feet and under. The iron in the lower rib shall not be strained to exceed 10,000 lbs. to the square inch of section, after a full allowance shall have been made for rivet holes. The iron in the upper rib shall not be strained in compression more than 7,500 lbs. to the square inch of section. Three-quarter inch rivets shall be used with a six-inch pitch. The web plates shall be from one quarter to one-half inch thick, according to the following table:

SPAN.	Each girder of single-track bridge and outside girder of 3-truss double-track through bridges.	Each girder of 2-truss double track bridges and middle girder of 3-truss double-track through bridges.	Each girder of 3-truss double-track deck bridge.
35 ft. and under....	¼ inch plate.	⅜ inch plate.	5-16 inch plate
Over 35 ft.....	⅜ do.	½ do.	⅜ do.

There shall be vertical stiffeners of T iron on each side not more than four feet apart, which shall be bent over and riveted to the top and bottom rib plates. Deck bridges shall have lateral bracing both above and below, and shall have diagonal vibration ties at least every ten feet. Through bridges shall have lateral braces at the bottom, and be stiffened by knee braces and gusset plates not more than ten feet apart, which shall attach to the girders at the vertical stiffeners.

In single-track deck bridges, two girders will be used, placed eight feet between centers. In double-track deck bridges, two girders will be used, placed 16 feet between centers, or three girders placed 10 feet between centers.

In single-track through bridges, two girders, and in double-track through bridges, three girders will be used. If not more than 3ft. 6in. deep, the girders shall be placed 13 feet between centers, if more than 3ft. 6in. deep, 13 feet apart in the clear.

The timber floor will rest upon the top of the girders in deck bridges, and on the inside of the lower rib plates of through bridges unless otherwise specially directed.

TRUSS BRIDGES.

For spans of over fifty feet truss bridges will be used. Unless otherwise specified, the form of truss shall be selected by the builder; but to secure uniformity in appearance and character, it is desired that all through trusses be built with inclined end posts, and a preference will be had for bridges built with pin connections.

In single-track through bridges and in double-track through bridges with three trusses, the trusses shall be placed fifteen feet apart in the clear, and in double-track through bridges with two trusses they shall be placed twenty-eight feet apart in the clear. There shall be a clear head room of nineteen feet above the rails. In single-track deck bridges the trusses shall be placed twelve feet between centers, in double-track two-truss deck bridges sixteen feet or more between centers, and in double-track three-truss bridges ten feet between centers.

Pony trusses shall be stayed by wind braces at every floor beam, these braces extending at least to the middle of the posts.

All tensile members shall be of double-rolled refined wrought iron of soft, fibrous texture, with an ultimate strength of 55,000 to 60,000 lbs. per square inch, which shall not take a permanent set under a strain of less than 23,000 lbs. per square inch, and shall elongate at least ten per cent. before breaking. Each bar containing a weld shall be tested to a strain of 20,000 lbs. per square inch, and the perfection of the weld established by striking the bar while under strain or by carefully measuring its elongation. If upset bars are used, the method of their manufacture must be approved by the Chief Engineer of the Erie Railway Company. No tensile member shall be subjected to a strain exceeding 10,000 lbs. to the square inch under the assumed maximum load.

Floor suspenders carrying but a single panel length of twelve feet or less shall have a section of 4 square inches in each truss of single-track bridges, and in the outside trusses of three-truss double-track bridges; and a section of seven inches in the middle truss of three-truss double-track bridges, and in each truss of two-truss double-track bridges; for panels more than twelve feet long the section shall be proportionately increased.

Compression members shall be of wrought iron; when the least dimension is not less than one-twelfth the length of the member, the iron may be subjected to a strain not exceeding 8,000 lbs. per square inch of section; when the least dimension is less than one-twelfth the length of the member, the strength of the member shall be determined by Gordon's formula, and it shall be proportioned with a factor of safety of 5.

Pins shall be of wrought iron, and shall be turned to fit the pin-holes within $\frac{1}{32}$ of an inch. The section of the pin shall be such that the shearing strain on such section shall not exceed 6,000 lbs. per square inch, and the diameter of the pin shall not be less than two-thirds the largest dimension of any tension member attaching to it. The several members attaching to the pin shall be packed close together, all vacant spaces being filled with washers. The lower chord shall be packed as narrow as possible, and the several parts must be so arranged as to produce no appreciable bending strain upon the pin. The effective length of the pin shall not be greater than the breadth of the foot of the post plus four times the diameter of the pin.

Special pains shall always be taken in drilling the pin holes, both in accuracy of fit and in exactness of length; and if the difference of length is such in several bars which are to be placed side by side, that when they are piled on each other, all being of the same temperature, both the pins will not pass through their holes at the same time without driving, the set shall be rejected. The full sections of all members, whether in trusses or laterals, shall be be kept up at the connections. The enlarged end of the eye bars shall have a connection outside of the pin hole one-fifth greater than the body of the bar.

The lateral braces shall, whenever practicable, be attached to the chords in such manner that the axis of each lateral strut shall coincide with the axes of the pins. The dimensions of the lateral rods shall be equivalent to the following:

SPANS.	Upper laterals in deck bridges, lower laterals in through bridges.	Lower laterals in deck and upper laterals in through bridges.
50 feet and under.....	1 inch round in.	⅞ inch round.
Over 50 and not over 100 ft.	1⅛ inch round in.	1 inch round.
Over 100 and not over 150 ft.	1¼ inch round in.	1⅛ inch round.
Over 150 ft.....	1½ inch round in.	1¼ inch round.

The lateral struts shall have a section of equivalent strength. In double-track two-truss through bridges, each top lateral rod shall reach across two panels passing through a strut at the middle of the bridge, and a stiffening strut running along the axis of the bridge shall connect the centers of the several lateral struts. Deck bridges shall have diagonal wind ties, of the same dimensions as the bottom lateral ties in single-track bridges, and as the top lateral ties in double-track bridges.

No wrought iron shall be used less than three-eighths inch thick, except in places where both sides are always accessible for cleaning and painting.

Cast iron may be used in bed plates, pedestals and washers, but never in any position where it is liable to receive a transverse or tensile strain. It shall be the best quality of soft gray iron.

FLOOR.

In deck bridges the floor will be formed of timber floor beams, 12 to 15 inches deep and 18 inches between centers, on which the rails shall be laid; these beams shall rest directly upon the upper chords, which shall be proportioned to carry a load of 5,000 pounds to the foot for each track between the points of support, in addition to the compressive strain to which they are otherwise subjected. In double-track two-truss deck bridges each timber floor beam shall be bolted to each truss with a bolt of one-inch round iron.

In single-track through bridges a longitudinal iron floor beam shall be placed in the center of each chord, each beam proportioned for a moving load of 2,500 pounds per running foot. These longitudinal floor beams will carry timber floor beams 8 inches by 15 inches placed two feet between centers on which the rails are laid.

In double-track two-truss through bridges there shall be a transverse iron floor beam suspended to the pin at each post by suspenders each having a section of seven inches for panels of a length of 12 feet or less; for longer panels the section of the suspender shall be proportionably enlarged. Three longitudinal floor beams of iron, placed 13 feet between centers, shall connect the transverse floor beams, being rigidly attached to them, on which shall be laid timber floor beams 12 inches deep to carry the track; the top of the longitudinal floor beams shall not be more than 11 inches below the top of the transverse iron beams, and they shall be kept as low as possible without projecting below the transverse beams. The outside longitudinals shall be proportioned for a rolling load of 2,500 pounds per foot, and the inside beam for a rolling load of 4,500 pounds per foot, and the transverse beams for the results of these weights at the three points of application; factor of safety six. The parallelograms formed by the iron floor beams shall be braced by diagonal ties of the sizes given in the table of lateral rods, and this shall be the only lateral bracing of the bottom chords.

BEARINGS, &C.

All trusses shall rest upon cast-iron bed plates placed upon the masonry, and shall have sets of rollers under one end.

In through bridges, knee braces of wrought iron shall connect the end posts with the end lateral struts. The portals at the end of each bridge shall be finished with an ornamental casting, the pattern for which shall be furnished by the Erie Railway Company, though the contractor will be required to make such alterations as are necessary to fit the pattern to the details of the bridge.

Report of the Central Pacific Railroad Company.

This company has never before published a report, we believe, and this fact, together with the great importance of its lines and the general interest in the results of lines under the peculiar circumstances of the Pacific coast, lead us to give an unusual space to it, and print in full the report of the President and General Superintendent, except the tables of steamers and the parts which are repeated:

PRESIDENT'S REPORT.

OFFICE CENTRAL PACIFIC RAILROAD COMPANY, SACRAMENTO, July 8, 1873.

The Directors herewith submit to the annual meeting of the stockholders of the Central Pacific Railroad Company such reports of subordinate officers as will give a general resume of the operations of the road from its commencement up to the first of this month, and a particular account of the condition of the company's property and financial condition up to December 31, 1872.

Your careful attention to these reports is invited.

The capital stock authorized is	$100,000,000 00
The capital stock subscribed is	59,644,000 00
The capital stock paid in is	54,283,190 00
Of the amount subscribed there is held in trust for the company	5,333,300 00

INDEBTEDNESS.

The debts of the company are:

Funded debt	$55,684,000 00
Less sinking fund	878,847 00
	$53,805,153 00
United States subsidy bonds	27,855,680 00
Total	$81,060,833 00

ASSETS.

The assets of the company are:

1,222 miles main line of railroad and telegraph, with all necessary sidings, turnouts, switches, turn-tables, depots, depot buildings, round-houses and snow-galleries, also wharves, slips, piers and steamers for ferries at San Francisco	(cost)	$130,485,678 74
Equipments for same—Locomotives, cars, snow-plows, etc	(cost)	5,622,693 04
Real estate purchased for use of road	(cost)	968,976 06
Shops and machinery	(cost)	1,280,223 25
Telegraph instruments, furniture, safes, etc., at stations and offices	(cost)	76,692 05
Sacramento river steamers	(cost)	330,372 90
Material on hand:		
In shops for constructing and repairs (per inventory)	(cost)	985,283 23
In store of supply department (per inventory)	(cost)	112,769 24
Fuel on hand (per inventory)	(cost)	325,048 53
Balance of accounts outstanding after deducting obligations		2,366,130 90
Farming lands—estimated value		29,306,000 00
Undivided half 60 acres land in Mission Bay, in San Francisco; 500 acres water front at Oakland; about 140 acres and water front at Sacramento—estimated value, independent of improvements		7,750,000 00
Cash in hands of Treasurer		147,156 06
Total		$180,257,024 00

LENGTH OF ROAD.

The following statement shows the length of the main line and branches, December 31, 1872:

Division.	Termini.	Length. Miles.
Main Line	San Francisco to Junction with U. P. R. R.	883
Oregon Division	Roseville to Redding	192
San Joaquin Division	Lathrop to Goshen	146
San Jose Division	Niles to San Jose	18
Alameda Division	Alameda to Haywards	17
Oakland	Oakland to Brooklyn	6
	Total	1,222

The length of side tracks is 110 40-100 miles, equivalent to an aggregate of 1,332 40-100 miles single track road.

STATEMENT OF EQUIPMENT—DEC. 31, 1872.

Locomotives	184	Pay cars	1
First-class passenger cars	93	Box freight cars	1,704
Second-class passenger cars	54	Platform cars	1,494
Palace sleeping cars	21	Section cars	179
Mail and express cars	15	Hand cars	223
Baggage cars	25	Dump cars	110
Caboose cars	38	Track-laying cars	51
Directors' and Superintendents' cars	2	Wrecking cars	2
		Snow-plows	7

In the Sacramento shops there have been, in addition to the above, 437 cars built since January 1, 1873; three locomotives, and seven now building and nearly completed. The Miller platform has been put on all the passenger cars, and passenger trains are equipped with the Westinghouse air brakes.

SHOPS.

There are complete and extensive shops for the construction and repair of locomotives and cars, fully equipped with most approved machinery for that purpose, located at Sacramento (within the city limits), on large and commodious grounds, belonging to the company; and also division repair shops, located at San Francisco, Oakland, Lathrop, Rocklin, Truckee, Wadsworth, Winnemucca, Carlin, Toano, Terrace and Ogden. These shops and the machinery have been largely added to during the year.

Far removed, as we are, from manufacturing centers, shops complete for the manufacture of cars and locomotives are a necessity which justifies the liberal expenditure above noted, of $1,280,223.25, made for that purpose, and the large amount of material necessarily kept on hand at a cost of $1,098,052.47.

STEAMBOAT PROPERTY.

[The President here gives tables of the ferry steamers, river steamers and barges which are owned by the company, by which it appears that it has seven ferry steamers, of from 285 to 1,012 tons burden, and an aggregate of 4,392 tons; no less than 29 river steamers, of from 30 to 1,625 tons, and an aggregate of 10,913 tons (an average of 377 tons); and 20 barges of from 100 to 800 tons, and an aggregate of 7,600 tons. This makes a fleet of 56 vessels having an aggregate carrying capacity of 22,905 tons, with wharves, piers and slips for their accommodation.]

One of these [ferry] steamers, the Thoroughfare, is a large, powerful boat, designed exclusively for transportation of freight trains between Oakland and San Francisco, with track capacity for eighteen cars, besides additional room and pens for sixteen car-loads of stock. It is a most decided success, and determines the question of manner of approach to the city of San Francisco.

THE RAILROAD HOSPITAL.

Located in the City of Sacramento, on ample grounds, is a large and commodious building, built by the company in 1869.

It is under the able administration of Dr. A. B. Nixon, and has fully realized the expectation of its founders.

Every officer and employee of the company contributes monthly fifty cents from his pay, as "hospital dues," which constitutes a hospital fund to defray the current expenses of the institution. The payment of this monthly hospital due entitles the employee to free admission and medical attendance at the hospital, in cases of sickness or injury while in the service of the company.

Thus far the fund from this source has been sufficient to defray the current expenses of the hospital and pay the interest on its cost. There is no reason to doubt it will continue to be self-sustaining.

The building of this asylum has proved a humane provision against the improvidence too frequent among men, and is regarded with favor among employees, tending to attach them to the service of the company.

The actual cost of real estate purchased for railroad, terminal and station purposes, on the line of your road, is $968,976.06.

Its real value at this time is very much more, as it has been largely enhanced since it was acquired, and from natural causes its value will continue to increase.

These locations and purchases were made with reference to the future wants, no less than the present need, of your company, and are believed to be ample to meet all the requirements of its increasing business for many years to come.

There have been important improvements made, at the joint cost to the Central Pacific and Southern Pacific Railroad companies of $352,224, upon the sixty-acre tract of land granted to these companies by the State, at Mission Bay, in the city of San Francisco. Further improvement is deemed unnecessary there until a proper ordinance shall be passed by the city authorities closing certain streets and allowing the cars to reach deep water, which, we understand, the city is now willing to do. At your next annual meeting we hope to be able to report that the necessary concessions have been made, and that the track has been extended to deep water so as to bring the cars and ships together at that point.

At the city of Oakland you have 288 acres most advantageously located, besides 500 acres of water front opposite the city of San Francisco, from which a pier has been constructed to ship's channel that amply meets the present wants of commerce at that point. One hundred and fifteen ships have taken full cargoes of wheat at this pier for foreign ports since the last harvest.

At the city of Sacramento your company was granted 2,800 feet of water front in the most central business part of the town. This grant was confirmed by act of the Legislature in 1863. It has since been improved by the construction of docks and tracks covering the entire length; with three stationary engines, derricks and other needful appliances for the rapid and economical discharge of merchandise and heavy weights to and from cars and water craft. As a business facility, in the interest of the increasing commerce centering at this point, it is exceedingly valuable. In addition to this water front property, your company owns a connected tract of about 140 acres, conveniently situated within the city limits, on a portion of which its principal shops are located.

At every station on the entire length of your road, ample room has been acquired for railroad purposes.

The right of way acquired from the National Government is four hundred feet in width, and that derived from individual landowners, as far as practicable, is of the same width.

The land grant from the United States Government to the Central Pacific Railroad of 12,800 acres per mile for 742 miles is	9,497,600 acres.
Deduct for lands previously granted and reserved, say	1,500,000 acres.
Leaves	7,997,600 acres.
The land grant to the California & Oregon Railroad of 12,800 acres per mile for 291 miles is	3,724,800 acres.
Total	11,722,400 acres.

[The grant to the C. & O. R. R. Co. provides that where lands are lost to the railroad company by reason of previous grants or reservations, they can be made good from an indemnity grant of ten miles in extent on either side of the twenty-mile limit, which insures to the railroad company the full amount of land granted.]

The value of these lands at the Government minimum price for adjoining lands, $2 50 per acre, would be | $29,306,000

Much of this is the choicest agricultural and timbered land in the country, and will sell for a much larger price.

The policy of the company has been to sell its farming lands at low prices, and on easy terms of payment to actual settlers, believing the best interests of the company are promoted by selling in limited quantities within twenty miles of its road to those who will cultivate the soil, and who will own the soil they cultivate. By this means we invite an industrious agricultural population, whose improvements and production tend to increase the business of your road and to enhance the value of your unsold lands. Most of the lands that have been sold were purchased for gold on a credit of five years, a payment of 20 per cent. being made at the time of sale, and the remainder in equal annual installments, with annual interest at the rate of 10 per cent. per annum, payable in advance, on all sums remaining unpaid.

Of these lands there were sold previous to October 1, 1870, 127,635 55-100 acres, which brought the sum of $295,065.50, being an average of $2.21 per acre.

From October 1, 1870, to December 31, 1872, there was sold 122,765 9-100 acres, which brought the sum of $484,227.97, being an average of $3.93 per acre.

From December 31, 1872, to June 30, 1873, there was sold 20,638 71-100 acres, which brought the sum of $132,337.54, being an average of $6.41 per acre.

These sales were made to 1,446 individual purchasers, being an average of about 187 acres to each buyer.

This annual advance in the average price of lands sold indicates the increasing value of the unsold lands of your company, and when viewed in connection with the annual increase of the business of your road, fully justifies the policy of selling, as far as practicable, to the actual settler for cultivation.

The active competition with the California Pacific Railroad Company for the traffic between Sacramento and San Francisco which existed in 1871 was terminated by mutual agreement between that company and your own, by which the Central Pacific guaranteed the payment of 1,600 of the twenty-year 6 per cent. mortgage bonds of the California Pacific Railroad Company for $1,000 each, which arrangement has proved highly advantageous to your company in a financial point of view.

Since the construction of your road to a junction with the Union Pacific at Ogden, there has been added to it by construction and consolidation 480 miles, viz.: Western Division, 141 miles; Oregon Division, 152 miles; San Joaquin, 146 miles; San Jose, 18 miles; Alameda, 17 miles; Oakland, 6 miles. All these additions to the main line have proven at once profitable investments, adding to and with themselves increasing the pro rata earnings and net income of each mile of the whole.

These additions, like the stem line, have mostly penetrated a sparsely settled and undeveloped country, but of vast resources, and together they may be said to command the entire scope of the San Joaquin and Sacramento Valleys, and all the country, in fact, whose business shall seek the Pacific. The Sacramento and San Joaquin Valleys—the two great valleys of California—alone comprise an area of 480 miles in length by an average of 70 miles in breadth, or 21,504,000 acres of arable land, susceptible of varied and most profitable cultivation, which must bring a very large traffic to your road as soon as they shall be brought into culture, and which is confidently expected in the near future.

From the valley of the Sacramento to Ogden, the Truckee and the Humboldt rivers alone offer a practicable pass through the ranges of mountains that occupy so largely the country from the Wahsatch to the Sierra Nevada, lying parallel to them and running north and south. The natural and only drainage of all that vast country, for hundreds of miles north and south, is to the lines of your road, and it is the same with the drainage of the great valley system of California. Your lines are so laid with reference to the topography and passes of the country, that these valleys and their tributaries are completely commanded, and hereafter the construction of all lines of railroads in this vast country of hundreds of thousands of square miles must prove feeders to your lines.

It is not too much to assume, that no railroad system in the world is so comprehensive as this which nature has pointed out, and which your company has been so fortunate as to secure and develop. It is the very key to the commerce of the Pacific.

The results of the operations of your roads for the year 1872 are more than satisfactory; they are conclusive of pre-eminent financial success. Though your lines command this vast country so rich in mineral, agricultural and manufacturing resources and of great commercial advantages, it is but sparsely occupied and but slightly developed, and your roads only fairly opened for business. Your interest account necessarily is large, consequent upon the cost of your roads.

The natural difficulties to be overcome upon the main line were immense. During the period when that work was being performed, the war of the rebellion was raging. Material was at war prices. The bonds received from the Government, as well as your own mortgage bonds, were sold for currency which had to be converted into gold at a great sacrifice. Yet, the year 1872 shows the ability of your roads to take care of themselves, and pay interest with a handsome balance over. With the population and development that is certain in the future, the annual increase of business for years to come will continue; as the causes remain, but with growing force, great financial success therefore is assured.

On the original line from Sacramento to Ogden, as well as upon the other parts, large expenditures have been made in perfecting them since they were opened for business, until now they are in such a state of completeness as to tracks, depots, machinery, snow galleries, docks, wharves and terminal accommodations and supplies on hand, that you may reasonably expect dividends upon your shares from this time on. Heretofore the net earnings have gone to construct and bring your property to its present state of completeness and effectiveness.

At the present time the question of control of railroads is somewhat agitated. Congress, in the Pacific Railroad Act, section 18, says: "And be it further enacted, That whenever it appears that the net earnings of the entire road and telegraph, including the amount allowed for services rendered for the United States, deducting all expenditures, including repairs and the furbishing, running and managing of said road, shall exceed ten per centum upon its cost (exclusive of the five per centum to be paid to the United States), Congress may reduce the rates of fare thereon, if unreasonable in amount, and may fix and establish the same by law." This takes the control of freights and fares on the Pacific railroads from the States and Territories through and into which they run, and leaves the question entirely with Congress, in accordance with the section above quoted. The principle embraced in the Act of Congress, that the companies are to control their business unmolested, in any event, until a fair return is had upon their investment, must prevail for all railroads.

Ownership and control must be inseparable. If the owners in a business are not to control, but its management and control to be by those who do not own, then that business cannot be prosecuted.

But the necessities of the case and the sense of justice will establish it as a principle, that ownership and control in railroad matters, as in other legitimate business, must go together.

During the past year much has been said about the relations of your road to the Government. Your Board of Directors are much pleased to be able to state that the company has more than fulfilled every obligation arising out of its contract with the Government, and has saved to the Government, by its rapid construction and consequent opening for business (seven years earlier than its contract required), more millions than the company netted in gold from the bonds received from the Government. All the additions are consolidated with the main line and are equally with it security to the Government for its loan, and these additions are and will ever be more valuable per mile than the greater part of the main line.

To confound the ignorant or malicious calumniators of your company, you can point to the record of what you have done and to the contract under which you did it. By the contract you will abide, and by it be judged, asking no favors, only justice; but if the equities are to govern, you can well afford to go into an accounting of mutual benefits and stand by the balance-sheet.

To give to the Government and the country the benefits of your road seven years earlier than the contract required, cost your company probably not less than ten millions of dollars more than it would have cost had the full time been taken for construction which the contract allowed. One of the reasons for this sacrifice to secure rapid construction was the absolute necessity of reaching the Great Salt Lake Valley in time to meet the Union Pacific there, so that we might command the business to that point and to the north and south of the line, and secure the fair advantages due the expensive work of the "Sierras." Almost any sacrifice was justified by this consideration, but the Government and the country have none the less the benefit of the sacrifice. And even your company, besides having secured the advantage consequent upon making the junction with the Union Pacific at Ogden, in the Great Salt Lake Valley, is in great measure compensated by having the benefits arising from the use of the road so early, and the development of business so much in advance of what otherwise would be the case. But no one could, at that time, foresee the great development of local business consequent upon the construction of your roads into the then unoccupied country between the valley of the Truckee and that of Salt Lake. It is a suggestive fact that between these valleys, a distance of nearly six hundred miles, where now there is a business such as demands lateral lines of railroads for its accommodation, there lived at the time when your road was commenced but one white man. The reports of other roads, so far as they have come to our knowledge, show no such wonderful increase of business yearly as, you will perceive, has been made by your roads. But we can now clearly see that they will be greater in the future.

The immigration this year promises to be more than double that of any year since the junction of the roads at Ogden.

The wealth of our soil, as exhibited in its great wool, grain and vine productions, and the advantages of climate, are attracting attention that must each year largely increase the flow of immigration.

The trade of the Pacific Ocean centering at the Bay of San Francisco shows a remarkable growth, and is a foretaste of the great business that is to come from the exchange of productions with the teeming millions of the islands of the Pacific Ocean and the countries bordering upon it.

Altogether the prospects of your company are bright, and you have the satisfaction of knowing, at the same time, you have performed a most beneficent work in opening up to settlement a country otherwise in great part inaccessible for development.

LELAND STANFORD, President.

GENERAL SUPERINTENDENT'S REPORT.

The following is the report (with the exception of such statements as are given before in the President's report) of Mr. A. N. Towne, the General Superintendent:

I respectfully submit herewith the following report of operations and business of the road for the year 1872, together with comparative statements of the previous year and for the six months ending June 30, 1873.

The earnings and operating expenses for the year ending December 31, 1872, were as follows:

GROSS EARNINGS.

Coin	$7,400 089 35
Currency	4,563 551 22
Total, coin and currency	$11,963 640 57
Total earnings, equal to currency	12,734,729 88

OPERATING EXPENSES.

Coin	$4,953,612 42
Currency	57,666 42
Total, coin and currency	$5,011,278 84
Total operating expenses, equal to currency	5,5?7,445 25

or 43 40-100 per cent. of the earnings.

Below I give you statement of the earnings and operating expenses for six months, ending June 30, for 1872 and 1873:

Gross Earnings for Six Months, ending June 30, 1872.

Coin	$3,126,694 97
Currency	2,007,640 14
Total, coin and currency	$5,134,335 11

For same period in 1873.

Coin	$3 409,375 46
Currency	2,379,441 17
Total, coin and currency	$5,788,816 63

Operating Expenses for Six Months, 1872.

Coin	$2,218,878 14
Currency	16.909 35
Total, coin and currency	$2,235,787 49

For same period in 1873.

Coin	$2,594,249 46
Currency	14,681 84
Total, coin and currency	$2,608,931 30

Showing an increase in earnings—

Coin	$282,680 49
Currency	371,801 03
Total, coin and currency	$654,481 52

For further details relating to earnings and operating expenses, I would respectfully refer you to the report of the Secretary, from whose department the reports are made up.

PASSENGERS.

The total number of passengers transported was	3,300,974
Increase over 1871	620,991

The earnings from this department for 1872 show a favorable increase over the preceding year by—

Coin	$559,764 72
Currency	19,2?5 99
Total, coin and currency	$578,970 71

Further reference is made to the detailed report from the General Passenger and Ticket Agent.

FREIGHT.

Total tonnage for 1872 was	pounds,	1,881,646,021
For 1871	"	1,142,730,000
Showing an increase of	"	738,916,021

The revenue derived from freight shows a large increase over 1871, as follows:

Coin	$1,732,170 22
Currency	581.462 61
Total, coin and currency	$2,313,632 83

The report of the operations of the freight department for the year 1872, submitted by the Assistant General Freight Agent, giving further details, will be found interesting—to which I refer you.

EQUIPMENT.

The rolling stock has been kept in the best possible condition.

Locomotives, in number 184, are all in excellent condition.

The expense for repairs for the year ending December 31, 1872, was $502,165.57, coin.

Ten new engines were added to the equipment, and three new and superior locomotives, of uniform style and pattern, have just been turned out of our Sacramento shops, to be followed by seven others, now well under way.

The number and kind of cars at the close of the year 1872 were as follows: [Given in President's report.]

All have been kept in the most thorough repair. 622 box freight cars and 204 platform cars were added to the rolling stock during the year 1872, and 437 cars since January, 1, 1873—all built at the car shops of the company, at Sacramento. The passenger equipment has been greatly improved by the application of the Westinghouse air brake and the Miller platform, the utility and economy of which are so universally recognized.

The cost of repairs of cars for the year ending December 31, 1872, was $458,860.83, coin.

The steam ferry-boat Thoroughfare, constructed in January, 1871, has been in constant use day and night, transferring cars between San Francisco and Oakland Wharf, and has answered well the purposes for which she was intended. On account of the large and increasing business, I deem it important, and would recommend the building of another of similar construction, for which we now have on hand nearly all the material, including the engines and boilers.

In view of the necessity for running sleeping cars to accommodate the increased passenger business on the San Joaquin Division, together with the general increase of business on the main line, I would recommend the construction of eight new cars.

The earnings for the six months ending June 30, 1873, as compared with those of the same period for the year 1872, show a general and satisfactory increase of business, which would warrant a reasonable expectation that the year will be one of great prosperity.

Notwithstanding the slight check on the Asiatic business, caused by storms on roads east of ours, during the winter of 1871-72, from which we have nearly recovered, the business at the present time is very good, and we may feel much encouraged, as I am confident the traffic of the future will be very large.

The promised line of steamers between San Francisco and Australasia will contribute much to our overland traffic.

The business passing over the road from the Sandwich Islands, Central America, Alaska and Washington Territories, and Oregon is not large, yet we may confidently expect a material increase.

Despite the strong competition from the East for the business of Idaho, Montana and Southern Utah, it is a matter of congratulation that we are able to hold out inducements to the merchants of this coast to enable them to get their full share of that trade.

The business already developed on the Oregon and San Joaquin divisions is very gratifying. A large increase may be looked for, as the roads are extended from time to time.

Although the local business to a great extent, through its entire length, has been created by the road itself, yet there seems to be no limit to the resources of the country through which it passes. Developments are manifest in all directions, and but for the scarcity of labor in the past and at present, more rapidly would they have been compassed. The immense herds of live stock fattening on the abundant and nutritious grasses of the Humboldt and contiguous valleys in Nevada, nearly all find a market at San Francisco.

Flouring mills are not alone confined to the valleys of California, where the bulk of the grain is produced; much of the grain grown in Nevada and Utah is milled there.

Other industries are springing up; additional stamp-mills and furnaces for the reduction of ore are being erected at various points in California, Nevada and Utah. The product from the saw-mills, scattered all through the great pineries of the Sierra Nevada range, seeks an outlet for the markets east and west; from stations along the Oregon Division as well as from the main line; all aiding very materially to expand the earnings of the road and promote business which will be permanent and lasting.

Towns, villages and mining camps are springing into existence on the main line; also on the branches, where but a few months since there were few inhabitants and little or no business. Immigration is slowly but surely finding its way to the great and fertile valleys of California, creating a population that is contributing to the business of the road and the general prosperity of the Pacific Coast.

The rapid construction of your road through the unpeopled sections, which at first offered so little encouragement for business, has clearly demonstrated the wisdom of its projectors, and a large and increasing traffic may be confidently expected, that will in a few years require a double track between Lathrop and San Francisco, for an economical disposition of the business offered.

While the business of the past has been all we could have hoped for, I am confident the future of your great and wisely located system of roads will far exceed the most sanguine expectations of its friends.

For the successful operation of the road I am indebted to my superior officers for their kind and cordial support; also, to the officers in my department and the men employed and working under their direction.

Preservation of Sheet Iron.

The direction of the Government Railroads of the Netherlands has published the results of some experiments in regard to the preservation of sheet iron used in railroad bridges. From thirty-two sheets half were cleaned by immersion for twenty-four hours in diluted hydrochloric acid; they were then neutralized with milk of lime, washed with hot water, and while warm dried and rubbed with oil. The other half was only cleaned mechanically by scratching and brushing. Four of each kind were then equally painted with red lead and with two kinds of a red paint of oxide of iron and with coal tar. The plates were then exposed to the weather and examined after three years. The result was:

1. That the red lead had kept perfectly on both kinds of plates, so that it was impossible to say if the chemical cleaning was of any use.

2. That one kind of iron oxide red paint gave better results on the chemically-treated plate than on the other: in fact, a result equal to that of the plate painted with red lead, while the other kind of iron oxide red gave not very good results on the plates when only scratched and brushed.

3. That the coal tar was considerably worse than the paint, and had entirely disappeared from those iron sheets which had not been treated chemically, but only cleaned by brushing.

The Westinghouse Air-Brake Patent.

A suit was commenced in the United States District Court at Cleveland, Ohio, August 8, by George Westinghouse, Jr., against the Gardner & Ransom Air Brake Company, of that city, for infringement of the Westinghouse air-brake patent. We do not know what the peculiarities of the Gardner & Ransom brake are.

RAILROAD GAZETTE

Published Every Saturday.

CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

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Editorial Announcements.

Removals.—*The Chicago office of the* RAILROAD GAZETTE *has been removed to No. 77 Jackson street, opposite Third avenue.*

The New York office of the RAILROAD GAZETTE *is removed to Room 131, No. 73 Broadway, opposite the upper elevator landing.*

Correspondence.—*We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.*

Inventions.—*No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.*

Articles.—*We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.*

Advertisements.—*We wish it distinctly understood that we wil entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

COMPETITIVE TRIALS OF LOCOMOTIVES.

During the last few years a series of annual competitive trials of portable engines has been made in England, under the direction of the Royal Agricultural Society, which have resulted in so much improvement in the design and construction of this class of engines, that they now stand almost unequaled in their economy of fuel consumption. If a similar series of trials of locomotives was made, in this country especially, it would, we believe, result in even greater improvement of the latter class of engines, and make possible a degree of economy which is now seldom or never realized. At the present time the only way by which a comparison of the performance of such engines can be made is to take the reports of the different master mechanics of the engines on their roads. Such reports, we regret to say, are not always strictly correct or trustworthy, and even if they were, the conditions under which the engines work are so diverse that it is difficult to make a comparison which will have any value. The character of the traffic of the road, the fuel and water, and many other attending circumstances and conditions vary so much that it is impossible to draw deductions from such reports which can confidently be relied upon. That there are still a great many disputed points and very great differences of opinion among those who design and superintend the working of locomotives, a very little intercourse with master mechanics and locomotive runners will reveal. The interminable discussion about "lap" and "lead" still goes on in every engine house wherever locomotives run. Long throw and short throw of valves, big wheels and little wheels, each have their adherents, and the merits of straight and wagon-top boilers and of a hundred different forms of smoke-stacks are apparently as far from being determined now as they were ten years ago. One reason for this, we believe, is because no direct comparative tests are ever made, such as will determine, in a conclusive way, the advantages of the different plans and methods of construction of these and other parts of locomotives. It happens very often, too, that experiments, when they are made, are tried, not for the purpose of discovering the truth, but to prove certain preconceived ideas, or to show the advantages of a given plan or method of construction. Nearly every one who has been disinterested, and has observed carefully, has seen how, in experiments tried under such circumstances, every incidental advantage would be thrown on the side whose success was desired. We never yet knew of a master mechanic who built a locomotive—especially his first—who did not unhesitatingly pronounce it the best on his road. Usually, too, such persons are of the opinion that the particular engine they have built is better than any which any one else has built. Now if it were possible to bring such engines to a direct test by running a train of a known weight a given distance, so that there could be no question about the amount of work done, it would enable persons to make direct comparisons, and draw conclusions based upon the actual performance of engines in doing as nearly as possible the same work.

It would, of course, be necessary to have such experiments made under the direction and authority of some properly constituted committee, who would prepare rules and conditions to be observed by all who entered for competition. Such rules would, of course, be analogous to those presented for horse and boat racing, excepting that greater scientific exactness and accuracy would be necessary for running locomotives than for either horses or a boat's crew.

In suggesting such experiments we quite naturally turn to the Master Mechanics' Association, or that of the superintendents, as the proper body to conduct them. If an annual trial of this kind were made under the direction of either a separate or joint committee, it would contribute more information regarding the economy of locomotive performance than anything else could, and if continued for successive years it would be certain to develop improvements and suppress wrong ideas and bad practice in locomotive design and construction to an extent which now is hardly suspected.

At present the favorite engines of different master mechanics do not come into competition with each other, although they differ materially in construction and proportion. It would doubtless be a very wholesome lesson for a master mechanic who is in the habit of building engines with very large wheels and small boilers to compete with a locomotive in which the relative proportions were reversed, and doubtless much more modest claims would be made for many a patent device if its merits and demerits were shown forth without fear or favor.

It would, of course, be impossible to propose any very definite plan for carrying out this suggestion. If, however, the arrangements were submitted to a suitable committee, and they were instructed to make arrangements with some road to have the use of a portion of its line on which to make the trials, invitations might be issued to master mechanics and locomotive builders to send engines to compete. It would, of course, be best to confine the competition each year to a given class of engines and service, otherwise there might be so many, and such a great diversity in their construction, as to make it necessary to occupy more time in making the trial than it would be possible to give to it. On nearly all roads there are certain times and seasons when traffic falls off and there would be cars to spare. If such a time were selected, and an experimental train were made up of spare cars loaded with some imperishable freight, the competing engines might each haul such a train any specified distance, and an accurate account be kept of its performance. Each engine could haul the same train over the same portion of the road, and thus do exactly the same work under the same conditions.

By noting carefully the consumption of fuel and water, a tolerably accurate idea could be formed of the efficiency of the different engines. To owners and managers of railroads such information would be very valuable, as it would be a guide to them in the selection of engines for the service of their lines.

Doubtless, too, such trials would bring to notice the value of many improvements, which now for the want of such an opportunity of showing their utility never receive the notice they deserve. The direction, however, in which we think the most improvement might be expected would be in the proportions of locomotives, and in the economy of weight. Probably one of the first things which would be revealed by such a trial would be that the engines with the largest boilers were the most economical in the consumption of fuel. This would quite naturally lead to inquiries regarding the best methods by which the dimensions of the boiler could be increased without diminishing the efficiency of the other parts. The necessary result would be that useless weight would be dispensed with whenever possible, so that the capacity of the boiler could be increased without exceeding the maximum allowable weight of engine. Competition of this kind would thus inevitably improve locomotive construction and performance, and in this way abundantly compensate railroad companies for the expense involved in making such experiments.

THE CENTRAL PACIFIC.

The report of this company, made at the annual meeting in July, the largest part of which we publish elsewhere, is, we believe, the first regular report that the company has published. It has, however, made frequent statements of its earnings and its expenses, and of the items of through traffic and their several quantities. Probably there is not much need of the publication of a report for the information of the stockholders, as it is understood that all or nearly all of the stockholders are also directors, the ownership of this vast system of more than twelve hundred miles of railroad forming almost the sole transportation routes of the great States of California and Nevada, being in the smallest and most compact body of proprietors, probably, that ever owned so important a system. But reports are, or should be, for the information of the public as well as the shareholders; and in this case the people of the United States as a whole have contributed $27,000,000 and more toward the construction of the road, and various municipalities in the State of California have made other contributions, which, though probably made without any other condition than that the road should be constructed, still causes the people to consider it their right to be informed concerning the condition and working of the company. However this may be, the people of California have showed pretty plainly of late that they wanted to know something of the affairs of the company; investigations have been made by journalists and others concerning the financial condition of the corporation or its members; statements have been made, seemingly well founded, that either the corporation or individuals had incurred an enormous floating debt at high rates of interest, presumably for the purpose of paying the coupons of the Central Pacific or an allied company, and negotiations were reported as having narrowly failed which would have given the control of the company to the creditors and other capitalists.

The statements concerning the floating debt were likely to injure the credit of the company seriously, and this may have induced the management to publish a full report.

This report, however, has not thrown much light on the financial condition of the company, for statements of the capital account have been published freely heretofore, and the information desired was concerning the floating indebtedness. But absolutely no account of this is given further than the extremely indefinite one that the balance of accounts outstanding, *after deducting obligations*, is $2,366,130.90; and we are left to imagine the nature and gross amounts of both accounts receivable and payable.

The Central Pacific, like the Union Pacific, was constructed by a corporation, the "Contract & Finance Company," which received the stock and bonds of the railroad company in payment for its work, so that substantially the road was given to the contractors as their payment for constructing it, as is frequently the case. In such cases no money passes for the shares, and it is impossible to say, without proof of the true money cost of construction, whether the shares represent any money expenditure—and also whether they do not represent an expenditure very much greater than their face. It is not probable, however, that the main line of the Central Pacific cost more than the proceeds of the bonds issued on it, nearly $26,000,000 of which is guaranteed, interest and principal, by the United States, and so arranged, we believe, that the Government can make no claim for either interest (which it has paid from the beginning) or principal, until the principal is due (in 1895, we believe), except to the amount of one-half the charges on Government transportation and 5 per cent. of the net earnings.

The Government subsidy was issued, however, on only 832 miles of the 1,222 miles of line now owned by the company, which has thus constructed without Government aid (but with some local aid), nearly one-half as much as the Government helped to pay for. The total bonded debt now, excluding the United States bonds, is $55,084,000, which is at the average rate of $45,000 per mile; with the Government bonds it is $81,060,833, or $66,334 per mile. This is not a consolidated debt, however, and the mortgages are for different amounts per mile on the different divisions, that on the old Central Pacific from Sacramento to Ogden, 759 miles, being, with the government subsidy, $68,220 per mile; on the Western Pacific, Oakland to Sacramento, 124 miles, about $38,000 per mile; on the California & Oregon, 152 miles, $44,408 per mile; San Joaquin Valley Division, 146 miles, $41,644 per mile; Alameda and Oakland lines, 23 miles, $21,740 per mile. Besides there is a convertible mortgage for $1,483,000,

RAILROAD EARNINGS FOR JULY, 1873.

Name of Road.	Mileage. 1873.	Mileage. 1872.	Increase. Miles.	Increase. P. c.	Earnings. 1873.	Earnings. 1872.	Inc.	Dec.	Per cent.	Earnings per mile. 1873.	Earnings per mile. 1872.
Atlantic & Great Western	539	539	.....	.....	$428,396	$417,903	$10,493	.....	2½	$795	775
Atlantic & Pacific	328	328	.....	.....	116,231	85,344	30.887	.....	36¼	354	260
Burlington, Cedar Rapids & Minnesota	334	261	73	28	88,637	73.833	14,804	.....	20	265	283
Central Pacific	1,218	1,094	124	11⅜	1,211.765	1,372.510	.....	$60,745	4¾	995	1,163
Chicago & Northwestern	1,404	1,353	51	3¾	1,240,987	1,029,957	211,030	.....	20½	884	761
Cleveland, Col., Cin. & Indianapolis	470	470	.....	.....	351,576	326 268	25.3 8	.....	7¾	74	694
Erie	971	964	7	0¾	1,685,384	1,518,911	166,473	.....	11	1,736	1,576
Illinois Central	1,109	1,109	.....	.....	672,917	609,846	63 071	.....	10⅜	607	550
Indianapolis, Bloomington & Western	344	212	132	61¼	121,276	100,860	20.416	.....	20¼	352	476
Kansas Pacific	672	672	.....	.....	323.233	321,774	1.459	.....	0½	481	479
Lake Shore & Michigan Southern	1,136	1,082	74	7	1,451,762	1,225,708	226,054	.....	18½	1,278	1,154
Marietta & Cincinnati	284	284	.....	.....	181.868	149.550	32,318	.....	21⅝	64	527
Michigan Central	787	715	72	10	581,168	505.808	75,360	.....	14⅞	738	707
Milwaukee & St. Paul	1,236	1,121	115	10¼	834,320	488.348	345,972	.....	70⅞	667	436
Missouri, Kansas & Texas	784	516	268	52	302 881	180 480	122,401	.....	67¾	386	350
Mobile & Ohio	517	517	.....	.....	149,093	158 526	.....	9,433	6	288	307
Ohio & Mississippi	393	393	.....	.....	255.424	222.862	32 562	.....	14⅝	650	567
Pacific, of Missouri	471	471	.....	.....	267,734	265,906	1,828	.....	0⅝	568	565
St. Louis, Alton & Terre Haute, Main Line	266	266	.....	.....	103,•41	94.427	9,414	.....	10	390	355
" " " Branches	71	71	.....	.....	47.691	35,243	12,448	.....	35⅜	672	496
St. Louis, Kansas City & Northern	583	583	.....	.....	201,769	201,491	278	.....	0⅛	346	345
St. Louis & Southeastern	349	349	.....	.....	99,524	71.675	27,849	.....	38⅞	285	205
Toledo, Peoria & Warsaw	237	237	.....	.....	108.038	90,071	17 967	.....	19⅞	456	380
Toledo, Wabash & Western	628	628	.....	.....	483 399	432,056	51,343	.....	11⅞	770	688
Total	15,131	14,215	916	6⅓	$11,308,914	$9.879,357	$1,499,735	$70 178	.....	$747	$695
Total increase	.....	.....	.....	.....	.....	.....	1,429,557	.....	14½	.....	.....

RAILROAD EARNINGS, SEVEN MONTHS ENDING JULY 30.

Name of Road.	Mileage. 1873.	Mileage. 1872.	Increase. Miles	Increase. P.c.	Earnings. 1873.	Earnings. 1872.	Increase.	Decrease.	Per cent.	Earnings per Mile. 1873.	1872.	Inc.	Dec.	P.c
Atlantic & Great Western	539	516	23	4½	$2,871,002	$2,751,534	$119.468	.....	4⅜	$5,327	$5 332	.....	$5	0⅛
Atlantic & Pacific	328	328	.....	.....	729,479	599 533	129,946	.....	21⅞	2,221	1,828	$396	.....	21⅝
Burlington, Cedar Rap. & Minn	334	261	73	28	570,672	483,797	86,875	.....	18	1,709	1,854	....	145	7⅞
Central Pacific	1,218	1,094	124	11⅜	7,532,553	6,781 126	751,427	.....	11⅛	6,184	6,198	....	14	0¼
Chicago & Northwestern	1,398	1,338	60	4½	7,238,657	6,410,944	827,713	.....	12⅞	5 178	4,791	387	.....	8⅛
Clev., Col., Cin. & Indianapolis	470	401	69	17¼	2,752,642	2,455,892	296.75)	.....	12⅛	5,857	6,124	....	267	4⅜
Erie	971	960	11	1⅛	10.861,391	10,513,957	347,434	.....	3⅜	11,186	10.933	253	.....	2⅜
Illinois Central	1,109	1,109	.....	.....	4,424,965	4,232,483	192,482	.....	4¾	3.990	3,807	183	.....	4¾
Indianap., Bloomington & W'tn	369	212	57	27	818,594	732,202	66,392	.....	8⅞	3,043	3 548	....	505	14¼
Kansas Pacific	672	674	.....	.....	1.973,980	1,973,528	452	.....	.....	2,937	2,936	1	.....	.....
Lake Shore & Mich. Southern	1,136	1,019	117	11¾	11,277,649	9,689,887	1,587,762	.....	16⅜	9,928	9.528	400	.....	4⅛
Marietta & Cincinnati	284	284	.....	.....	1,357,141	1,054 481	202,660	.....	19¼	4.428	3,718	715	.....	19¼
Michigan Central	725	715	10	1⅜	4,353,218	3,760,583	492,635	.....	13⅛	5 867	5,260	607	.....	11½
Milwaukee & St. Paul	1,173	1,076	97	9	4,453,001	3,413,510	1,039,491	.....	30½	3,795	3,171	624	.....	19⅝
Missouri, Kansas & Texas	661	495	166	33½	1.740,837	850,171	883,666	.....	102⅜	2.634	1,738	896	.....	51½
Mobile & Ohio	517	517	.....	.....	1,547,649	1,489,752	57,897	.....	3⅞	2,994	2,882	112	.....	3⅞
Ohio & Mississippi	393	393	.....	.....	2, 79 177	1,840,335	238 842	.....	13	5,292	4,683	609	.....	13
Pacific, of Missouri	471	405	66	16¼	1,996,797	1,900 441	96,356	.....	5 1/16	4.239	4,692	....	453	9⅝
St. L., Alt. & Terre H'te, main line	266	266	.....	....	802,351	763,112	39,239	.....	5⅛	3,016	2.869	147	.....	5⅛
" " " branches	71	71	.....	....	343.567	275,645	67,922	.....	24⅝	4,839	3 882	957	.....	24⅝
St. Louis, Kan. City & Northern	583	583	.....	....	1,492,756	1,575.675	.....	$82,919	5¼	2,560	2,703	....	143	5¼
Toledo, Wabash & Western	628	628	.....	....	3,188,417	3,185,402	3 015	.....	0⅛	5,077	5,072	5	.....	0⅛
Total	14,216	13,343	873	6½	$74,205,495	$66,752,990	$7,535.421	$82,919	.....	$5,220	$5,005	$217	.....	4⅜
Total increase	.....	.....	.....	.....	.....	.....	7,452,505	.....	11¼	.....	.....	.....	.....	.....

and California State aid bonds for $1,500,000 which are perhaps secured on the whole property, and $9,153,000 is secured by the land grant only. The capital stock for the whole property is $54,283,190, or at the rate of $44,421 per mile, making the average capital account per mile of road $110,755, which is exceeded by only three or four companies in the United States.

What the President says as to the location of the company's lines for commanding the traffic of the Pacific coast is generally quite true. Together with the Southern Pacific, which is owned by the proprietors of the Central Pacific, this company's lines are so placed as to control nearly the whole traffic of California, excepting that of a narrow strip west of the Coast Range and north of San Francisco, and this local traffic is likely to be worth many times more than the through traffic over the main line, which, however, has reached considerable proportions, and doubtless pays a moderate profit over working expenses.

The results of the operation of the road are very interesting. They are given for two years, and also for the half-year ending with June. The mileage differed for each of these periods, and the average mileage worked for each period is not stated in the report, and we are not able to give it now. But for the year 1872 they were at the rate of $10,612 currency per mile for 1,200 miles of road, which is near the average for the year, and for the last half-year they were at the rate of about $5,146 currency per mile on 1,222 miles, it being much the poorest half of the year, the enormous shipments of wheat, which forms by far the greatest item of freight in California, being carried almost entirely in the last half of the year. The increase has been steady and large from the first opening of the road, and only two things can stop this rapid increase—one the cessation of the growth of California; the other a sudden large decrease in rates. The tonnage is less heavy than the earnings would indicate, as the rates are comparatively high for freight, having been in 1872 an average of 3.66 cents per mile on 235,637,223 tons hauled one mile, which is about equivalent to Chicago, Burlington and Quincy rates in 1865-66 and New York Central & Hudson River rates in 1864-65, when the currency was very much depreciated, and about two-thirds greater than the first-named company's average rate in 1872, and two and one-quarter times the latter's rate. Of course we do not make these comparisons for the sake of ascertaining whether the Central Pacific's rates are too high or low; scarcely any comparison is useful for such a purpose, as each line must adapt its rates to its circumstances, and the circumstances of scarcely any two roads are the same, while those of the Central Pacific are peculiar.

The most notable fact reported is the extraordinary low proportion of working expenses to earnings, being as small as 43.4 per cent. in 1872, which is as low as on the best English railroads. This is partly due, no doubt, to the character of the country in which the lines are situated, where very little damage by the elements is incurred for most of the year; partly to exceptionally careful and intelligent working of the lines, which is probably equal to that of any system in America; and largely, doubtless, to the comparatively high prices received for transportation—the cost of which, of course, remains the same whatever may be received for it.

Whatever may be the issue of the financial arrangements of this company, which can hardly be serious until after the interest and principal guaranteed by the Government becomes due, its property cannot fail to be extremely valuable, and for many years to come more and more productive.

COUNTERBALANCING LOCOMOTIVES.

Notwithstanding all that has been written on this subject, it still seems to be very imperfectly understood. On the majority of railroads we believe that no attempt at calculating the weight of the counterbalance required is ever made, but as much or as little is put into the wheels as is convenient, and if practical experience indicates that more or less is needed, it is either added or removed as may be necessary. One master mechanic whom we know of tested the counterweights in his engine by placing a pail of water on the front of his engine, and regulated them until either none of the water or a very small quantity was spilled by the running of the engine. Another and doubtless a better way of making such a test is to suspend the engine by chains at the four corners, and then set it running. If a pencil is then attached to the engine, the diagram which it would describe on a card would show whether it had too much or too little counterbalance.

Probably the most complete investigation of the theory of counterbalancing locomotives was made by M. Le Chatelier, a Frenchman, who published his investigations in a pamphlet in 1849. The substance of his investigations on this subject is given in D. K. Clark's "Railway Machinery." It is not our purpose now to go into an analysis of the theory of counterbalance weights, but to state the general principles, which are comparatively simple, involved in the investigations referred to, which, if divested of their analytical character, are easy of comprehension.

They may be stated as follows: 1. All the revolving parts attached to each crank pin should be counterbalanced in the wheel to which they are attached. 2. One-half the weight of the reciprocating parts should be counterbalanced in *each* wheel, in engines with two wheels coupled, one-third when three, and one-fourth when four wheels are connected. Of course, the farther the counterweight is from the center of the axle the smaller it can be to counterbalance a given weight at the crank-pin.

To counterbalance the main driving wheels of an ordinary American engine with outside cylinder, it would therefore be necessary to get the weight of the crank-pin, the crank-pin-boss, one-half the coupling or side rods, and the back end of the main connecting rod. This, with one-half the weights of the front end of the main-rod, the cross-head, piston and piston-rod, would give the weight at the crank-pin which must be counterbalanced in the main driving wheels. In the back drivers, the weight of the crank-pin, crank-pin-boss, and one-half the coupling or side-rod, with one-half the weight of the reciprocating parts given above, is the weight at the crank-pin which must be counterbalanced.

As stated before, the farther the counterweight is from the center of the axle, of course the lighter it can be to balance a given weight at the crank-pin. Now having determined the position which the counterweight will occupy, its exact weight may be determined by multiplying the weight at the crank-pin with the distance of the center of the latter from the center of the axle or half the stroke, and dividing the product by the distance of the center of gravity of the counterweight from the center of the axle. The center of gravity of the counterweight may usually be found by making a wooden template of the form of the weight, and suspending it freely, first from one corner and dropping a plumb-line from the point of suspension, and marking its position, and then repeating the operation from another corner, and noting the point of intersection of the line with the first position, which will be the center of gravity.

When very small wheels are used, as is commonly the case with heavy engines of the mogul and consolidation patterns, it is often difficult to get room for counterbalances of the requisite weight. They are sometimes made as thick as possible so as to get the requisite quantity of material in them, whereas passenger engines with large wheels are often counterbalanced by casting the rim of the wheel hollow and filling it with lead.

It seems very probable that the theory of counterbalancing locomotives is not yet thoroughly understood. A comprehensive analysis of the whole subject, however, involves some very abstruse questions, whose solution would require more time and space than we can give them here; and before a theoretical investigation of this kind could be relied upon its conclusions should be confirmed by practical experiment. The directions we have given are, however, based upon the best authority, and, we believe, will give very good results in practice.

The Danger at Grade Crossings.

When laws were enacted compelling all railroad trains to come to a dead stop on approaching crossings, it was thought that if the laws were observed a collision at such places would be almost impossible thereafter. That the enactment and observance of such laws do not entirely eliminate all danger of collision at such places was shown by a recent accident at the intersection of the Lake Shore & Michigan Southern and the Fort Wayne, Jackson & Saginaw railroads. At this place trains on the Lake Shore line, being the oldest road, have the right to cross first when a train on each road approaches at the same time. At the date of the accident referred to, two trains, one on each road, were approaching the crossing simultaneously. After the Lake Shore train—which had the right to cross first—had made its stop, the signal-man observed that the Fort Wayne train was coming so fast that he thought the former could not cross before the latter reached the intersection of the two lines. He therefore signaled both trains to stop, and after the Fort Wayne train stopped he gave the signal for the Lake Shore train to cross. In the subsequent investigation the engineer of the Fort Wayne train said that he did not see the Lake Shore train, and when he saw the signal-man turn the signal, supposed it was for his train, and, without observing the signal given, started his train, although the semaphore was against him. The engineer of the Lake Shore train, seeing the signal for him to cross, started his engine about the same time. The signal-man, seeing that there was danger of a collision, went on the track and swung his hat to stop the Fort Wayne train. The locomotive runner of the Lake Shore train, also seeing the danger, blew the whistle for the Fort Wayne train to apply the brakes, and at the same time put on the Westinghouse air brakes to his train. The locomotive runner of the Fort Wayne train says that the signal from the whistle of the Lake Shore engine

was the first information that he had of the presence of that train. The two engines met at the crossing, and the pilot of each was broken. The Westinghouse brake, in this case as in many others, prevented a much more serious accident, and probably serious loss of life.

The circumstances attending the accident were somewhat unusual, and indicate the danger which must always attend a grade crossing, even if guarded by the most careful system of signaling.

American Railroad Mileage.

While Parliament was considering the "Regulations of Railways Bill," Captain H. W. Tyler, one of the Railway Inspectors of the Board of Trade, and perhaps the most trusted government officer in the matter of railroad business and statistics, made the following reply to the chairman of a committee as to the number of miles of railroad worked in the United States:

"About 40,000 miles of railway already working; but they arrive at their total by doubling the quantity for their double lines, and they sometimes add the sidings in."

Captain Tyler was entirely mistaken. While all, or nearly all, of the States that require reports require statements of the length of double track and sidings, the total mileage given is of main line and branches only; and in all cases in which companies report the length of their lines, double track and sidings, we have found but a single instance of a company's counting a double track as two roads, and that was a comparatively short section. At the end of 1872 there was in the United States about 67,000 miles of railroad, nearly all of which must have been worked at the time Captain Tyler gave his evidence, *not* including second track and sidings.

Record of New Railroad Construction.

This number of the RAILROAD GAZETTE has information of the laying of track on new railroads as follows:

Montpelier & Wells River.—The western section is extended from Nesmith's Brook eastward 4 miles to Marshfield; and the eastern section from Wells River northwest 7 miles to South Ryegate, in all 11 miles. *Ashburnham.*—Completed from a junction with the Vermont & Massachusetts and Cheshire railroads at Ashburnham, northward 2¾ miles to Ashburnham Center, Mass. *Danville, Tuscola & Western.*—Track is laid from the junction with the Paris & Danville Railroad five miles south of Danville west by south 15 miles to Indianola, Ill. *Wisconsin Central*—Extended from Salem, Wis., north 21 miles to a point 135 miles from Menasha, Wis. *Texas & Pacific.*—The *Jefferson Division* is extended from Jefferson north by east 9 miles to Monterey, Tex.

This is a total of 58¾ miles of new railroad, making a total of 2,025 miles completed in the United States in 1873.

THE TAXATION OF RAILROAD LAND GRANTS has been the subject of a recent decision of Judge Dundy, of the United States Circuit Court, in a case in which the Union Pacific Railroad Company brought action to restrain the collection of taxes on certain of its lands between the ten and twenty-mile limit. The company made its case on the ground that it had not as yet taken out patents for lands between these limits, and the title remains in the United States. But the Court decided broadly that the lands granted cannot be taxed until after the company has sold them, for the reason that, by the terms of the grant, the lands will be open to pre-emption if not sold by a given time. An unpaid tax would give the authority levying it the power to sell the lands taxed, which would be an infringement of the government's right to the reversion of it.

MEXICO has elected its new Congress, and two-thirds of the members are reported to be supporters of the Administration, which Administration, it will be remembered, has made a contract with the Mexican International Railroad Company, represented by Mr. Edward Lee Plumb, for the construction of a system of railroads. This contract has to be ratified by the new Congress, and the large Administration majority in that body almost insures its favorable action, notwithstanding the telegram which says, "It is understood the majority of the new Congress will be opposed to all concessions to citizens of the United States."

NEW PUBLICATIONS.

Steam Boiler Explosions: by Zerah Colburn (D. Van Nostrand, New York.)

This is an American edition of a paper first published ten or fifteen years ago, and is now, we believe, out of print. Doubtless the attention which will be drawn to this subject by the experiments which are soon to be made under the direction of the Navy Department is the reason for republishing it now. Much of the value of the essay is due to the admirable refutations of the common theories of "overheating, spheroidal state of water, electricity and decomposed steam," to which boiler explosions are so often attributed. Mr. Colburn rejected the theory that boiler explosions are usually due to over-pressure of steam, and in this essay attributes them to the percussion action of steam and water combined. This theory he states as follows:

"If we suppose a considerable rupture of any part of [the boiler, anywhere above the water line, the steam already formed would rush out with a velocity at first of about 2,000 feet per second. Before the heat contained in the water could so far overcome the inertia of the water as to disengage additional steam, the upper part, or steam space of the boiler, might be nearly emptied. The steam which would inevitably rise from the water would thus strike at a great velocity upon the upper part of the boiler, and no doubt the steam carries a great quantity of water with it. In some of the earlier locomotives, having a deficiency of steam room, the partial removal of the pressure from the water by opening the regulator or "throttle" was attended by a rise of water to the extent of from 8 to 10 inches. But while this result attended the removal of perhaps 1-20 of the superincumbent pressure, its sudden and entire removal would cause a tremendous blow to be discharged—whether by the steam alone or by the combined steam and water—upon the sides of the boiler, sufficient, no doubt, not only to extend the rupture already existing, but to completely rend the boiler in two or more parts. * * * These effects would follow when the boiler had ruptured in consequence of some defect in its structure, under a moderate working pressure, as well as under such immense pressures as are commonly assumed in cases of violent explosion."

Doubtless some such action as Mr. Colburn describes does take place when a boiler explodes, but the primary rupture after all must be attributed to over-pressure, or, as Mr. Coleman Sellers once aptly stated it, "the pressure inside the boiler is greater than the strength of the material outside," so that if we discard Mr. Colburn's ingenious theory and assume the simpler one of Mr. Sellers, we will, we think, be nearer the truth, so far at least as concerns the practical construction and care of boilers.

Mr. Colburn's book contains, however, much useful information, very clearly stated, and in a condensed form. His refutation of the commonly prevailing theories by which boiler explosions are explained is excellent, and would, if read by those who are always ready with an electrical or gaseous theory to account for any and all boiler explosions, show them what silly nonsence they often talk. We advise all interested, and some who are not, to read this book, which they can do in an hour or two. We will add that the price of it is 50 cents, and it is the second number of Van Nostrand's "Science Series."

Quick-Transit in Cities.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Permit me to criticise some points in Mr. Nicholl's paper on this subject, in your paper of August 16. He says that the only advantage of underground railways is, that they are out of the way. Against this, he says they will not be well ventilated, and that the stairs to them will be dark. These remarks apply to the plans he specifies; but there is another plan, first proposed by P. W. Barlow, to which they do not apply.

Adapting Barlow's plan to Broadway, it might be as follows: Starting from the Battery, it would run under the lots between Broadway and Church or Mercer streets. The stations would be in rooms level with the sidewalks. The rails would plunge steeply to a depth of thirty feet, then change to a level, going under sewers, cellars, etc., in tunnels, which would be driven. At the foot of each incline would be a stationary engine of sufficient power, with help of gravitation, to start a car or train at 35 to 40 miles per hour, which would carry it to the next summit. No locomotive being used, the ventilation would be easy, and half the usual wear of rails would be avoided, and ascending and descending stairs would be avoided.

Mr. Nicholl says the ground in the lower part of New York is loose sand. It is polar drift, and as good ground to drive a tunnel through as can be found. The rock above Fourteenth street would make the work very costly; but Mr. A. P. Robinson, C. E., who estimated on the Manhattan plan, did not consider it prohibitory. Before admitting the rock as an objection, I should wish for careful estimates of the cost of the different plans.

The average speed on Barlow's plan, with stations ½ mile apart, can be 16 miles per hour. On the Metropolitan, with stations ⅓ mile apart, it is 12½ miles per hour, and would be less than 12 with ½ mile stations.

I do not believe that any of the proposed plans will pay interest, from date of investment, even if land damages be evaded, by going under or over streets; but I believe Barlow's plan will be the cheapest to work, and the least damaging to land, considering the effect of impairing the solidity of the streets by tunneling under them; and that it is the best plan for the Broadway route.

J. K. FISHER.

No. 30 Broadway, New York.

One Hundred Miles an Hour.

It will scarcely be disputed that to possess the power of traversing long distances at a velocity of 100 miles an hour would be advantageous to a very large section of the community. The average speed on the best mail coach lines in 1829 and 1830 was a little over ten miles an hour; and many individuals possessing the power of thinking clearly and writing well argued that no augmentation of mail coach speed was necessary, desirable or likely to produce any benefit to the nation. The advent of railway speeds sufficed in a very short time to prove that all arguments of this kind were fallacious. In 1830, speeds of thirty miles an hour were regularly attained by railway trains, and the advantages to be derived from this rate of traveling were quickly and keenly appreciated by the public. In the same way, and for the same reasons, it is certain that the benefits to be gained by the power of reaching Liverpool in two hours, or Vienna, for example, in twelve hours, would be quickly recognized by the nation, and it is probable that a sufficient number of passengers, at considerably higher fares than those which are now paid, would be obtained on any great main line to justify directors in putting on one or two extra trains in the day which would maintain when running an average velocity of 100 miles an hour. How much the public would be content to pay for such a privilege it is of course impossible to say with accuracy; but we believe there is a fair probability that trains traveling at 100 miles an hour could be made to pay, provided the cost of running them was not enormously in excess of the cost of running an ordinary express train, timed, say, at forty-five miles an hour. In considering the subject, this question of cost is one of the most important features to be dealt with. A more important question, however, is this: Is it possible to attain, or having attained, to maintain, at any price whatever, or under any conceivable conditions, a velocity of 100 miles per hour? This question must be settled first, as it would be absurd to attempt to calculate the cost of an impracticable undertaking.

The highest railway speeds in the world are attained in England, and the highest railway speed in England is attained on the Great Western Railway, and this speed may be taken roundly at fifty miles an hour. But this by no means represents the maximum velocity which can be reached in running with a powerful engine and a light train on a good line.

There is a tradition in existence that Brunel once traveled from Swindon to London at eighty miles an hour; but we have never been able to obtain a shadow of proof that this speed has ever been reached under any circumstances, or at any time whatever on a railway. Mr. Stirling has run with one of his great outside-cylinder express engines and a train of sixteen carriages at seventy miles an hour on the Great Western, on a level or with a slightly falling gradient; and we know that the Farnsworth express on the Great Eastern sometimes has reached a speed of sixty-four miles an hour down the Brentwood Bank. On two occasions, some years ago in Ireland, we ran 14 miles in sixteen minutes with a powerful engine and a train of but two carriages. Much of the run was done at over 65 miles per hour. On the Boston & Albany road, U. S., the 54 miles between Springfield and Worcester were run by an engine with 16in. cylinder, 22in. stroke, and 6½ft. driving-wheel, in fifty-eight minutes. Much of the run was done at nearly 70 miles an hour. On a first-class line there can be no question, therefore, but that a speed of sixty-five and seventy miles an hour may be available with safety. It is doubtful, however, whether a much higher velocity, such as 100 miles an hour, would also be available without incurring enormous risks of derailments.

Brunel proposed at one time, when a line was laid on stone sleepers or piles, to take a truck over it with two revolving grindstones in front which should grind the rails to a dead smooth face. His ideal of permanent way was a lathe bed. We know now, and Brunel lived long enough to know also, that many of the ideas he entertained in the early days of his career were chimerical. But we none the less believe that it would be possible to lay permanent way so well and to maintain it in such excellent order that trains might travel on it with perfect safety at 100 miles an hour. Miles upon miles of such track are to be found now on most of our great main lines, but it is not to be disputed that nowhere can 100 consecutive miles of permanent way in perfection be found, and, as a chain is no stronger than its weakest link, so a few hundred yards of bad track would spoil, for the purpose of traveling at 100 miles an hour, a whole line. It would not be impossible, however, to maintain a line of such rails from London to Liverpool or York. First-rate ballasting would be required, and the rails would be best constructed on Ashcroft's system; that is to say, with a steel rail laid between two iron cheeks, so that no fish-plates, nor any joints, in the ordinary sense of the word, would be used. The rail would, of necessity, be of great depth to insure rigidity, without which the resistance would be so augmented that the required velocity could not be maintained. It is scarcely necessary to add, that steep inclines would be absolutely excluded by the conditions.

Let us assume that a line, good, safe, and rigid enough for a speed of 100 miles an hour is to be had. That in fact it is provided ready to the hand of the mechanical engineer—the man who has to design the rolling stock to work it—and proceed to consider what this rolling stock must be. It is obvious that the carriages should be as light and strong as possible, and we shall content ourselves with this statement regarding them for the present. The really important question is, given the line and carriages fit for it, what shall the engine be like, and is it possible to construct an engine at all which, with a moderately heavy train, will attain and maintain a velocity of one hundred miles an hour, on a line with no grade heavier than say 1 in 300. The first points to be settled are, how much power can a locomotive of a given size develop, and how much power shall we require to haul a train which will suffice to satisfy the demand of that portion of the public wishing to travel at 100 miles an hour? Let us assume that the train will consist of three first-class carriages, and a brake van, the carriages weighing each 8½ tons and the van 10 tons, or in all, say 35 tons. No experiments whatever have been made with trains traveling at a speed of 100 miles an hour, and it is therefore impossible to do much more than guess at the probable resistance to be overcome. At 60 miles an hour on an ordinary line, and making due allowance for contingencies, it cannot, according to experiments carefully carried out both in France and in this country, be much under 40 lbs. per ton. At 30 miles an hour the resistance is about 20 lbs. per ton; at 47 miles an hour the resistance reaches 32.5 lbs. If the resistance goes on increasing in this proportion, then the resistance at 100 miles an hour cannot be less than 75 lbs. per ton; but it may be very much more, and it would not, we think, be safe to take it at less than 120 lbs. per ton. Now a speed of 100 miles an hour is 146.5, or, in round numbers, 146 feet per second, or 8,800 per minute. This multiplied by 120 and divided by 33,000, gives, say, 32 horse-power. "The Great Britain" broad-gauge Great Western engine, with its tender, in running order, represents a weight of about 64 tons, and a heating surface of 2,100 square feet. This engine has indicated over 800 horse-power. To run such a machine and a train weighing 35 tons, or a gross load of 99, or, say in round numbers 100 tons, at 100 miles an hour would require 100x32 or 3,200 horse-power, or just four times more power than the most powerful high speed locomotive that has ever been built could exert. To run the engine weighing 38 tons, alone, would require a power of 1,216 horses, assuming that the engine resistance was identical with that of a carriage. These figures suffice to prove that it is absolutely impossible to obtain a speed of 100 miles an hour on a railway, if the resistance is anything like 120 lbs. per ton.

It will be seen, then, that the whole question may be narrowed to one point, and that point is train resistance. It is little more than waste of time to discuss any other question connected with the matter, such as safety and working expenses, until it has been settled whether it will become possible to construct an engine of sufficient power to fulfill the intended purpose. Many improvements have been effected in the construction of locomotives since the Great Britain was built, but we shall be going almost too far if we take it for granted that an engine can be constructed which will weigh in running order 30 tons only, and yet be able to develop 1,000 horse-power. It is probably not possible to construct such an engine. Now, 1,000 horse-power represents 33,000,000 foot pounds per minute. If the resistance is to remain equivalent to 32 or 33 horse-power per ton, it follows that the maximum load that 1,000 horse-power could transport at 100 miles an hour is only about 32 tons. As, however, the engine alone would weigh 30 tons, next to nothing is left for coal or water, to say not a word about passengers. With a 60-ton engine it is doubtful if we should have much more margin of power than would barely suffice to carry a very limited supply of water; certainly nothing like enough for even a ten-minutes' run, and as Ramsbottom troughs could not be laid down everywhere, the steam would break down at once, simply on the ground that water enough could not be carried.

If it can be shown, however, that the resistance could be brought much below 120 lbs. per ton, then it may be possible to attain a velocity of 100 miles per hour. A train of sixteen carriages and a Great Northern express engine may be taken to represent 180 tons. At seventy miles an hour, let us suppose the resistance to be 40 lbs. per ton, or 7,200 lbs. Seventy miles an hour it 6,160 feet per minute, and

$$\frac{7,200 \times 6,160}{33,000} = 1,344 \text{ horse-power.}$$

It is extremely improbable that any locomotive on the Great Northern ever exerted so great a power as this, and we are therefore led to believe that when Mr. Stirling obtained a speed of seventy miles an hour it must have been under such conditions that the resistance was less than 40 lbs. per ton. The end would be secured, of course, if the engine and train were descending a moderate incline, but it is also possible that under any circumstances of grade the resistance may have been less

than 40 lbs. per ton. We have stated that it would hardly be safe to assume that the resistance at 100 miles an hour would be less than 120 lbs. per ton; but it must be borne in mind that this statement is only based on a somewhat weak line of reasoning—based on analogy.

It is known that train resistance increases in a very rapid ratio with speed; but as experiments at such speed as we have spoken of—that is to say, 70 or 100 miles an hour—have never yet been made to determine the precise resistance, it is quite impossible, as we have pointed out, to say with precision what the true resistance is. And, besides all this, it must not be forgotten that as the evil influence of small imperfections in a road is greatly magnified as the velocity increases, so it is possible that the resistance on a road rigid and even enough to be run over safely at 100 miles an hour might be enormously less than the resistance of what is known as an ordinary fair road. This is a very important point, to which we shall return at another opportunity. Meanwhile, we may say, in dismissing the whole subject for the moment, that there is good evidence in support of our assertion, that it would not be safe to take the resistance at 100 miles an hour on an ordinary railroad at less than 120 lbs. per ton, in the fact that there is no recorded instance of a locomotive engine, whether with or without a train, ever having ran at a greater velocity than a little over seventy miles an hour.—*The Engineer.*

General Railroad News.

PERSONAL.

—Mr. George Reddington, Superintendent of the Delaware Division of the Erie Railway, left his post August 13, on a two months' leave of absence. During Mr. Reddington's absence, Superintendent E. O. Hill, of the Eastern Division, will take charge of the Delaware Division also.

—Mr. Adams Earl has resigned his position as President of the Lafayette, Muncie & Bloomington Railroad Company.

—General A. B. Warford, who had been Chief Engineer, Superintendent and President of the Northern Central Railway Company, died at his residence in Harrisburg, Pa., August 17, after a lingering illness. General Warford had had more than forty years' experience as an engineer, and was highly esteemed both in his profession and as an upright and worthy citizen. He was about seventy years old at the time of his death.

—Mr. L. L. Pierce, Master Mechanic of the Peninsular Division of the Chicago & Northwestern Railway, died at his residence in Escanaba, Mich., August 12.

—Tuesday afternoon last there was rumor in New York that Commodore Vanderbilt was dying at Saratoga. A dispatch stated that, on the contrary, at 11 in the evening he was playing euchre and holding the winning hand.

ELECTIONS AND APPOINTMENTS.

—At the annual meeting of the Cape May & Millville Railroad Company in Camden, N. J., August 12, the following board of directors was chosen: Thomas Jones Yorke, Charles P. Stratton, Camden, N. J.; Coleman F. Leaming, Jacob F. Cake, Cape May Court House, N. J.; Strickland Kneass, A. W. Markley, George B. Roberts, James H. Stevens, E. L. B. Wales, Philadelphia. At a meeting of the board, T. Jones Yorke was elected President, G. J. Robbins Secretary, and B. F. Lee Treasurer.

—Mr. J. G. Rohn, late Master of Transportation, has been appointed General Agent at Pittsburgh of the Pittsburgh, Washington & Baltimore Railway. Mr. W. H. Gerhart has been appointed General Car Agent in connection with other special duties, with office at Connellsville, Pa. Mr. W. T. Jacoby has been appointed Train Master, with office at Connellsville, and will have charge of the telegraph department, and control of trainmen and employees.

—Mr. Horace A. Towne, who for several years has been Master Mechanic of the Hannibal & St. Joseph Railroad, has been appointed Superintendent of Machinery of the Northern Pacific Railroad, in place of Mr. George B. Cushing, resigned. Mr. Towne belongs to the railroad family of which one brother (Mr. A. N. Towne) is Superintendent of the Central Pacific, another Assistant Superintendent of the Hannibal & St. Joseph, and a third Superintendent of the Missouri Division of the Missouri, Kansas & Texas. Mr. Towne's headquarters will be at St. Paul, Minn.

—At the annual meeting of the Freehold & Jamesburg Railroad Company in Camden, N. J., August 12, the following board of directors was elected: Richard S. Conover, South Amboy, N. J.; Joseph Coombs, William Conover, Sr., Freehold, N. J.; Isaac S. Buckalew, Jamesburg, N. J.; Benjamin Fish, Lewis Perrine, Trenton, N. J.; William H. Gatzmer, Strickland Kneass, George B. Roberts, Philadelphia. Subsequently the board re-elected Benjamin Fish, President and Isaac S. Buckalew, Secretary and Treasurer.

—Mr. John McManus, of Reading, Pa., has been chosen President of the California & Texas Railway Construction Company, which is now building the Texas Pacific Railroad, in place of General B. H. Bristow, of Kentucky, who has resigned.

—The directors of the recently organized Camden & Bordentown Railroad Company are as follows: Randall E. Morgan, Camden, N. J.; Joseph Eyre, Florence, N. J.; Edwin A. Ford, Bordentown, N. J.; Albert A. Taylor, Samuel H. Robbins, Allentown, N. J.; William Bell, Perth Amboy, N. J.; Thomas D. Harrison, Jersey City, N. J.; Allen Hay, C. D. Van Wagner, Thomas G. Rigue, Theodore Perry, Robert Hay, C. E. Harding, New York.

—Mr. Julius Hayden has been appointed General Southern Agent of the Atlanta & New Orleans Short Line, which is composed of the Atlanta & West Point, Western (of Alabama), Mobile & Montgomery and New Orleans, Mobile & Texas roads.

—Mr. Samuel Schoch has been appointed Superintendent of the Marquette, Houghton & Ontonagon Railroad. Mr. Schoch was formerly for some years Superintendent of the Morris & Essex Railroad and was recently Superintendent of the Houston & Great Northern road.

—Mr. Thomas A. Bissell has been appointed Master Car Builder of the Pullman Palace Car Company's Detroit shops in place of C. F. Allen, resigned. Mr. Bissell has been for some time in the Detroit shops, we believe, and, like Mr. Allen, was formerly in the Aurora shops of the Chicago, Burlington & Quincy Company.

—Mr. Sherman Conant has been appointed Business Manager of the Jacksonville, Pensacola & Mobile Railroad. Mr. M. R. Walker has been appointed Superintendent of the road, in place of F. B. Papy, who has resigned.

—The officers of the Great Southern Railway Company of Georgia are: President, T. W. Osborne (late United States Senator from Florida); Secretary, M. H. Alberger; directors, T. W. Osborne, M. H. Alberger, S. Conant, Jacksonville, Fla.; M. L. Stearns, Quincy, Fla.; W. T. Trammell, of Georgia; A. C. Osborne, New York; L. Goldstone, of California.

—At the annual meeting of the Portsmouth & Dover Railroad Company at Dover Point, N. H., August 14, the following board of Directors was elected: Frank Jones, Daniel Marcy, Albert R. Hatch, John H. Bailey, Portsmouth, N. H.; Oliver Wyatt, Andrew H. Young, Amos D. Purinton, Dover, N. H. The board elected officers as follows: President, Frank Jones; Clerk, John S. H. Frink; Treasurer, George L. Treadwell.

—The officers of the Great Southern Railway Company of Florida are: President, T. W. Osborne: Secretary, M. H. Alberger; directors, T. W. Osborne, M. H. Alberger, S. Conant, Jacksonville, Fla.; M. L. Stearns, Quincy, Fla.; W. L. Wood, of Dakota; A. C. Osborne, New York; L. Goldstone, of California.

—Mr. Otis Kimball has been appointed General Freight Agent of the Eastern and Maine Central Railroads. Of Mr. Kimball the Boston *Advertiser* says: "He has been in the freight business for more than a quarter of a century. Almost before transportation by railroad had begun he was agent of the Merchants' Transportation Company, the most important forwarding company on the Erie Canal. Afterward he was agent of the Vermont Central Railroad, and rendered important service in organizing that line as a through route; and still later as general agent of the Lake Shore & Michigan Southern Railroad he originated the plan of running through cars; and this in time resulted in the organization of the Red Line Transit Company, which has been remarkably successful, and has been followed by the organization of other similar companies."

TRAFFIC AND EARNINGS.

—During the month of July, the Utah Central road carried 23,164,030 pounds of freight, the heaviest items being: coal, 3,902,950 pounds; ore, 2,218,317 pounds, and lumber, 2,999,450 pounds. During the same month the Utah Southern road carried 13,819,748 pounds of freight, the heaviest items being 3,738,387 pounds of ore, 1,418,740 pounds iron ore and 922,100 pounds coal.

—The earnings of the Kansas Pacific Railway for the first week in August were: from passengers, $28,209.83; freight, $47,045.10; mails, $2,055.31; total, $77,310.24. Of this amount, $3,399.59 was for transportation of troops, mails and government freight.

—The earnings of the Marietta & Cincinnati Railroad for the first week in August were: 1873, $38,325; 1872, $35,368; increase, $2,957, or 8⅜ per cent.

—The earnings of the Chicago & Northwestern Railway for the first week in August were: 1873, $238,411; 1872, $217,683; increase, $20,728, or 9½ per cent.

—The earnings of the Erie Railway for the first week in August were: 1873, $394,517; 1872, $381,529; increase, $12,988, or 3⅜ per cent.

—The earnings of the Indianapolis, Bloomington & Western Railway for the first week in August were: 1873, $38,928; 1872, $29,763; increase, $9,165, or 30¾ per cent.

—The earnings of the St. Louis & Southeastern Railway for the month of July were: St. Louis Division, $60,959.75; Nashville Division, $38,564.39; total, $99,524.14. The earnings of the road in July, 1872, were $71,674.84, showing an increase this year of $27,849.30, or 38⅞ per cent.

—The earnings of the St. Louis & Southeastern Railway for the first week in August were $27,644.61. The earnings of the St. Louis Division for the week were: 1873, $17,516.08; 1872, $9,048.69; increase, $8,467.39, or 93½ per cent.

—The earnings of the Northern Railway of Canada for the half year ending June 30 were as follows:

	1873.	1872.	Increase.	P.c.
Earnings	$441,528 06	$390,271 03	$51,257 03	13⅛
Expenses	285,567 23	238,364 79	47,202 44	19⅞
Net earnings	$155,960 83	$151,906 24	$4,054 59	2⅝

The percentage of expenses to earnings in 1873 was 64¼ per cent., and in 1872, 61½ per cent.

CHICAGO RAILROAD NEWS.

Chicago & Iowa.

A telegram from Aurora to the effect that "it was reported" that the Chicago & Northwestern had leased this road and would extend its Batavia Branch to Aurora to connect with it, and so regain control of the passenger business between Chicago and Dubuque, has been widely copied and talked of. It must have originated in the mind of the reporter. The Chicago, Burlington & Quincy owns (or did recently) one-half of the stock of the Chicago & Iowa Company, and it isn't easy to see how the latter's road could be leased to the Northwestern or any other company without the consent of the Chicago, Burlington & Quincy.

Pittsburgh, Cincinnati & St. Louis.

This company has received proposals from contractors for the construction of a new passenger depot at the corner of Carroll and Clinton streets.

Chicago, Burlington & Quincy.

The shops of this company at Aurora are progressing as rapidly as possible toward completion. The wood-working and machine shop, and the freight-car shop are all well along. The two latter are 80x310 feet in size each, and the former 80x300. They are of brick, one story high with stone foundations and covered with slate on a wood truss. For the locomotive department, the company is building a combined blacksmith and boiler shop 200x80 feet in size, also constructed of brick with stone foundations and iron roof, truss covered with slate. The walls of the blacksmith shop are up, and the wood-working and machine shop is in an equally forward state. The foundations are laid for the freight car shop, and have been commenced for the coach shop. All the masonry is to be done by the 15th of September, and it is designed to have the buildings under cover by the end of September. The new shops will be models of completeness and convenience. They will be so arranged that machinery will do a maximum amount of work with a minimum of human supervision. These shops are the carrying out of a plan which was formed four or five years ago and which the fire enabled the company to put into effect. Chief Engineer Hjortsberg is turning his attention to the details of the work in such a manner as to insure their being models of their kind.

Two men, or rather a man and a boy, have been arrested for placing obstructions upon the Mendota & Clinton line of this road some time ago. They confess to putting a stick across the track, but say they only did it "for fun." They also stoned a passenger train, which was also "for fun," probably. They have been held for trial, and it is to be hoped that they will be put where they cannot have any more "fun" of this kind.

Chicago & Northwestern.

A new station has been established on the Milwaukee Division, between Ravenswood and Rosehill, and seven miles north of Chicago, which is called North Ravenswood.

Illinois Central.

The remaining lands belonging to this company will probably all be disposed of in a body next November. A contract has been entered into between the company and A. J. Galloway & Co., Chicago real estate agents, for the sale of all the lands remaining unsold south of the St. Louis, Alton & Terre Haute Railroad, amounting to about 320,000 acres. These lands are all covered with forest trees and lie from seven to fifteen miles from the road. The contract price is $3.50 cash per acre, and the purchasers, it is understood, are going to sell the lands to European settlers. This sale, if it is consummated, will include all lands heretofore sold, but the purchasers of which have been delinquent in payment, as well as all lands remaining unsold when the contract shall go into effect. North of the St. Louis, Alton & Terre Haute road there remains only about 15,000 acres unsold, which the company will readily dispose of in the usual manner, except such lands as are of no use whatever.

This company is about constructing a very large freight depot at Dubuque, Iowa. It will be 304 feet in length by 56 feet in width. The height of the walls will be 16½ feet. The building will be of brick, with stone trimmings.

Chicago, Rock Island & Pacific.

The Chicago *Tribune* gives the following account of some of the new improvements of this road:

"In addition to their splendid depot in this city, they have also just completed a fine passenger depot at Rock Island, near the bridge. They are also building a new and commodious freight depot and a large roundhouse for forty-two engines. The latter is 300 feet in diameter. A second track has just been completed between Fort Warren Junction and Colona, and men are now grading for and laying a second track between Morris and Seneca, which will be completed by the 1st of next month. Two miles of second track have also been completed east of Joliet. The company intend to gradually lay a second track along their entire line. They have also completed three new iron bridges, namely: One of 150 feet span over Green River; one of 50 feet span over Nettle Creek, and one of 150 feet span over Cedar River. Spring Creek they have spanned with a stone bridge of two arches 60 feet long. At Rock River Bridge a new signal station has been erected and a second track laid. They have also in contemplation a new iron bridge, 100 feet long, over the Calumet River at Blue Island to replace the present wooden structure. All these improvements have been made, and are still carried on under the supervision of A. L. Mortimer, Chief Engineer of the Illinois Division. He is busy day and night preparing maps and plans. All the old maps were destroyed by the great fire.

An old officer of the company has supplied us with copies of the annual reports of 1852, 1856, 1857 and 1862, which are extremely interesting. For the first-named year John B. Jervis, the eminent engineer, was President of the company, who reports that the cost of the 180 miles from Chicago to Rock Island will be, substantially, $4,300,000. Mr. Jervis had been Consulting Engineer the previous year, and his report is given. The contract was then let for the construction of the part of the line between Chicago and Ottowa. He estimated a traffic of about $4,600 per mile. From this it was calculated that 7 per cent. interest could be paid on $2,000,000 of bonds, and 15 per cent. dividends on $2,200,000. This was in the days (now, alas! long past) when a road might be worked for 45 per cent., which is the allowance made by Mr. Jervis in 1851. In the year ending July 1, 1855, the earnings were already $1,242,906, but the capital account of the road had then risen to $6,000,000, and it was working the Peoria Branch, and the working expenses were very nearly 50 per cent.

A correspondent writes from Trenton, Mo., on the Southwestern Division of this road, that the company has built there new shops and an engine-house, etc., and furnished them with new tools from Wm. Sellers & Co. He says that for a repair shop it is not to be beat, and that parties wishing to build would do well to visit. He adds, "We claim to have a first-class railroad in every respect, with very heavy grades and short curves, not quite as bad as some in Peru."

General Passenger Agent Smith has just received thirty magnificent photographs of the Yo Semite scenery, which will be framed and hung in the company's new passenger agency in the Pacific Hotel. They are about 20 inches square and were made by the celebrated Muybridge, of San Francisco.

Chicago, Danville & Vincennes.

At a meeting of property owners in the towns of Lake and Worth, held in Chicago, August 11, the Chairman stated that he had presented the reports of the committees appointed at the previous meeting on the right of way for the proposed new line into Chicago to Mr. Young, General Manager of the road. The route of the new line has been located on the center lines of Sections 2, 11, 14, 23, 26 and 35, Town of Lake, thence obliquely through the N. ½ of Section 2, Town of Worth to the west quarter line of Section 12, Town of Worth. Thence south on the west quarter lines of Sections 12, 13, 24, 25 and 36, Town of Worth, to the west side of Blue Island. About a mile and three-quarters east of the north point mentioned it will connect with the Columbus, Chicago & Indiana Central just south of the canal or near the crossing of that road and the Chicago, Burlington & Quincy, and enter the city on its track as now. Nearly all the property owners on the line have agreed to give the right of way for the new line.

The line described, beginning at the north junction with the Columbus, Chicago & Indiana Central at the canal, will be six miles from the depot in the city near Halsted street, and just two miles east by north from the southwest corner of the city limits. Thence the route is west by south, close to the bank of the canal, a mile and a half, and thence nearly due south 12 miles, making a half mile of easting, to the west side of the village of Blue Island, and thence nearly due southeast 5½ miles to a junction with the old line about two miles south of Dolton. This makes the new line 19 miles long, which is three miles longer than the route now used, over the Columbus, Chicago & Indiana Central road. The new line will give room, however, for the establishment of five or six new suburban towns, which may be made to yield a considerable traffic should they grow to be well peopled, and one station may yield a considerable country traffic.

Freight Business.

During the past week all the Western and Southern roads centering in Chicago have had a large increase of their freight business, confined almost exclusively to the movement of grain. On Friday, August 15, the Chicago, Burlington & Quincy road had 626 loaded cars on the company's track in Chicago, and 250 more loaded ones waiting to be transferred to the city. Of this number 95 cars were loaded with merchandise, 168 with stock and 365 with grain. This company's rates for grain were put down very low last spring in Iowa, and have remained so all the season thus far. The Illinois Central Company had 200 cars loaded with corn on its tracks on Saturday, and a big demand for cars to ship wheat in Iowa. The Rock Island and the Chicago & Alton roads have had employment for all their freight cars; and so has the Chicago & Northwestern. Owing to the superiority of the grain inspection in Milwaukee, much of the June wheat is seeking that market at present. Since August came in, the railroad officials generally say that the people have apparently accepted the new freight tariffs, and shipments have been equal to what they were under the old law.

Chicago & Paducah.

This road was opened from Chicago to Windsor, July 30. One passenger car runs from Chicago every day at 9:15 a. m., attached to the Chicago & Alton train, and running on that road to Pontiac. The company proposes to construct 30 miles more of road this season, which will carry it from Windsor to the crossing of the Vandalia road. The road has already developed a considerable freight business, as many as 80 cars passing over the road in a single day.

An excursion train of three cars was to pass over this road as far as Windsor, the present terminus, August 20, having on board a large number of railroad and business men, including among others the general officers and board of directors of the

road, several invited railroad men from other roads and some New York capitalists.

Freight Rates Westward.

On August 14 a reduction took place in west-bound freights between New York and Chicago, leaving them at present as follows: first class, 40 cents; second class, 40 cents; third and fourth classes, 30 cents and 25 cents for special freight. This is the greatest break in rates for two years and indeed the only considerable one. It is the more unfortunate for the railroads because a reduction in rates on west-bound freights scarcely affects the bulk of shipments.

THE SCRAP HEAP.

Railroad Manufactures.

The works of the Rhode Island Locomotive Works are situated in North Providence, and the buildings and yards cover ten acres of land. The ground floor of the 28 buildings comprised in the establishment has altogether an area of five acres. The largest building is constructed of brick, and incloses three hollow squares. It is 250ft. long and 88ft. wide, mostly three stories high. It contains machine shops, carpenter shop, pattern shop and the office. Two 80-horse engines working together furnish the power, one a Corliss and the other built by Tisdale & Carpenter. Another large building, which is used for light forging and boiler shops, is L shaped, the long part being 332 by 37 feet, and the short part 165 by 54 feet, all built of brick. Two buildings stand in the angle of the L, used for machine shops, one 60 by 40 feet, and the other 120 by 60 feet. The new forge shop is 160 by 60 feet, constructed of brick with an iron roof. The iron foundry is 175 by 100 feet. Attached to this is a triangular structure 137 feet front. The new boiler shop is 138 by 60 feet, now in course of erection. The paint shop is 100 by 50 feet, with a fire-proof addition, 50 by 12 feet, for storing paints and oils. The repair shop is 100 by 50 feet. The first locomotive was turned out in September, 1866, and up to the present time 620 have been completed. About 900 men are now employed and a large number of orders are on hand, including a number for the Lake Shore & Michigan Southern and the New York & Oswego Midland.

The Washburn Car-Wheel Company, whose shop was lately removed from Worcester, Mass., to Hartford, Conn., are turning out 30 steel-rimmed wheels per day, and have orders for six months ahead.

The works of the Oxford Co-operative Car Company at Oxford, Pa., are rapidly approaching completion and work will be commenced on cars in a few weeks. The company has already orders on which to commence. It will construct passenger and freight cars, and is said to have secured a large number of experienced workmen and to have unusual facilities for shipping cars.

Handling Baggage.

Superintendent Parker, of the Connecticut & Passumpsic Rivers Railroad, has promulgated an order strictly forbidding the careless and improper handling of all baggage by employees of the road.

Large Trains.

The Harrisburg (Pa.) *State Journal* of August 6 says:

"Engine No. 584, of the Pennsylvania Railroad, pulled out of the Lebanon Valley yards, yesterday, to the yards of the Pennsylvania Railroad, 250 4-wheel cars (or 125 8-wheel cars) at one draft. Engine No. 291, of the Pennsylvania Railroad, some time since pushed 135 8-wheel cars across the canal, up grade, as far as North street, where the train was stopped. It was found necessary to detach 15 cars, however, before the engine could start the train again."

The Humber Tunnel.

The projected tunnel under the river Humber in England, which is to be 2,840 yards long, is described as follows by an exchange:

"It will begin at Hessle, on one side of the river, and terminate at Barton, in North Lincolnshire. The curve of the tunnel will be ten feet below the river bed, and as this consists of sand, the work will be done by means of the pneumatic process. In carrying it forward three working vessels will be provided. The dimensions of these will be 160 feet each in length by 42 feet in width, and 23 feet in depth. The upper half will consist of a pontoon and the lower half of a working chamber or diving bell. This working vessel will suffice for the construction of 160 feet in length of a double tunnel in one portion. The process will be, first, to span the working vessel over the site of the tunnel; then to sink it to the bed of the river by the admission of water into the pontoon, and, thirdly, to expel the water from the lower portion, or diving bell, by forcing in air, when workmen will enter the chamber and excavate the ground for the construction of the 160 feet length of tunnel. When the working vessel has been sunk through the material of the bed of the river to the depth of the inlet of the proposed tunnel, bricklayers will enter and commence to build the tunnel. When completed, the working vessel will be withdrawn and sunk at another spot for the execution of a further length. The joining up of the isolated lengths of the tunnel will be effected as the working vessel is being from time to time withdrawn from the bed of the river. The machinery for supplying the required air and pressure to keep the diving bell portion of the apparatus free of water will be erected on a deck or table carried a sufficient height above the level of high water when the working vessel is in the lowest position. As has already been stated, the excavations, being chiefly sand, will be removed by means of sand pumps worked by the compressed air in the diving bell. The brick and other materials will be lowered by machinery from the stage above referred to in the working chamber. Although the process is new in its application to a railway tunnel, yet it has been employed with success in putting brick foundations in several parts of the world, and no doubt is felt as to its being equally successful in its new application."

We believe, however, that Parliament failed to pass the bill authorizing the construction of the tunnel at its last session, and it is consequently postponed for a year at least.

Payment of Damages for Personal Injury in Germany.

A Berlin letter says: "The deplorable railroad accident at Fröttstedt will offer the first opportunity of applying the Imperial German law in regard to the compensation which railroad companies are obliged to give to the injured party. The Thuringian Railroad, on which this accident happened, belongs to the Association of German Private Railroads, which binds itself according to its regulations, to carry the damage done jointly, in as far as the same exceeds the sum of 1,000 thalers."

This would seem to offer a premium to the most careless management, or rather to insure it against the effects of its carelessness.

OLD AND NEW ROADS.

Portsmouth & Dover.

At the annual meeting of this company at Dover Point, N. H., August 14, the stockholders voted to accept the recent act of the New Hampshire Legislature which provides that this road, or any road having connections therewith, may build one or more wharves at Noble's Island, Portsmouth, and run their roads to the same. The time of holding the annual meeting was fixed for the second Saturday in August hereafter. A vote was passed authorizing the President and Treasurer to sell and execute deeds for such property as the road did not need, and all previous sales by the directors were ratified and confirmed.

The engineer stated that the work was progressing well, that there was no trouble at the Piscataqua Bridge, and that the cost of the road would probably not exceed the original estimate of $599,000.

Hoosac Tunnel.

Only 1,000 feet now remain to be cut through. The work of enlarging the tunnel to the full size has now been completed from the east end up to the central shaft.

Shreveport & Southwestern.

This company purposes building a railroad from Shreveport, La., southwest to Logansport, in De Soto parish, a distance of 40 miles. The work on the line is exceedingly light, and it is said it can be very cheaply constructed. It is the intention of the company to extend the road beyond Logansport to Shelbyville, Tex., to connect with the projected Orange, Jasper & Shelby road in Texas.

Orange, Jasper & Shelby.

A company by this name was lately chartered by the Texas Legislature to build a railroad from Orange, Tex., the point where the New Orleans, Mobile & Texas road is to cross the Sabine River, northward through Jasper and St. Augustine to Shelbyville, a distance of about 125 miles.

Delaware, Lackawanna & Western—Morris & Essex Division.

The bids for the construction of the new line through Bergen Hill were opened August 18, and referred by the board of directors to Mr. Archbald, the Chief Engineer, for his report. Twenty bids were received. The work is to be completed in 21 months from the signing of the contract.

It is reported that the company will establish a ferry of its own to transport passengers from Hoboken to New York. It now uses for that purpose the ferry belonging to the Hoboken Land & Improvement Company.

The contract was awarded to John McAndrew, of Scranton, Pa. The terms of the contract are not made public. The work comprises two tunnels, one of about 1,700 feet and one of 1,500 feet, with an open cut between the tunnels about 1,200 feet long. The approach on the Hoboken side is to be trestle work. On the west end there is to be a bridge over the Erie track and also a new bridge over the Hackensack River. The new line will intersect the present one near the new shops of the Pennsylvania Railroad.

California Central Narrow-Gauge.

The grading on this road is progressing well from Benicia, Cal., northward. Contracts are being made for ties, and iron has been already ordered. Notice has been given to stockholders that an installment of 10 per cent. on stock subscriptions will be called for September 1.

Great Southern.

This company proposes to build a railroad from Jesup, Ga., the crossing of the Atlantic & Gulf and Macon & Brunswick roads, south to King's Ferry on the St. Mary's River, and thence south by east to Jacksonville, Fla. The length of the road would be about 93 miles, making a line 150 miles long from Savannah to Jacksonville, or over 100 miles shorter than the present line by way of Lawton and Live Oak. The portion north of King's Ferry (63 miles) is to be built by a Georgia company and that south of King's Ferry by a Florida company, separate organizations, but having the same name and the same officers. The contractor for the Georgia section is W. C. Alberger, of Buffalo, N. Y., formerly Superintendent of the Buffalo, New York & Philadelphia road. The city of Jacksonville, Fla., has granted the company the right of way through the streets of that town. The country on the line is pine woods, with poor soil, and a very thin and poor population.

Burlington & Missouri River.

The Leavenworth (Kan.) *Times* of August 16 says: "Superintendent Talmage, of the Atlantic & Pacific, reports that they have given the Joy roads satisfactory terms for occupying and using their road from the Junction to the Union Depot. Arrangements have already been made with the Rock Island road and the bridge company, so that we may expect to see the Chicago, Burlington & Quincy trains running at an early day from Leavenworth to Chicago."

The freight depot at Creston, Ia., with a large amount of freight and seven cars, was burned August 15. The fire is supposed to have been started by an incendiary.

New York, New Haven & Hartford.

Plans have at last been adopted for the new station at New Haven, Conn. The building is to be 271 feet in length by 55 feet width. The foundation is laid on 1,200 piles, driven from seventeen to twenty feet into the ground to hard bottom. The piles are spruce, brought from Nova Scotia. The building is to be three stories high, with a large basement. There are to be three towers, with rounded roof, the highest point on the center tower being eighty feet from the ground. The foundation stones are Portland brown stone. The walls of pressed brick will be relieved by trimming with polished brown stone. Light will be furnished by mullioned windows, which will be pointed with arches, also of brown stone. The waiting rooms will be large and calculated for the comfort of the traveling public. The trains will not enter the building, but will come up on the south side. In addition to the building, long and commodious platforms will be built to accommodate the heaviest trains.

The present station has the unenviable reputation of being the worst and most uncomfortable to be found in any large town in New England.

Considerable improvements are being made on the Shore Line Division, from New Haven to New London. The long high truss bridge over the Quinnipiac River at Fair Haven has been rebuilt, and no less than eleven of the pile bridges between Stony Creek and New London have been reconstructed. The track is now being relaid with steel rails.

Express Privileges on Railroads.

The Supreme Court of New Hampshire, at Concord, N. H., August 14, gave a decision stating that railroad companies have not the right to grant exclusive privileges to any party or parties to carry express matter over their lines.

Jersey City & Albany.

Four passenger and one mixed train are now run each way daily over this newly completed road. The stations and the distances from the junction with the New Jersey Midland road (which is 12 miles from Jersey City) are as follows: Cedar Lake, 2 miles; West Englewood, 2.84; Bergen Fields, 4.74; Schraalenburgh, 5.50; Lowden, 6.10; Haworth, 7; Frankfort, 7.58; Randall's, 8.79; Alasco, 10; Tappantown, 11.93.

Terre Haute & Indianapolis.

The Terre Haute (Ind.) *Express* says that in the case of the State of Indiana against this company recently in an interlocutory opinion rendered by the Court it passed upon this section of the charter, and held that nothing could accrue to the school fund until the Legislature had interfered and regulated the tolls, and that as no such legislation had been had, the failure of the company to pay over its surplus earnings above 15 per cent. is not a ground of forfeiture, and that no suit can be maintained to recover money for the school fund till such legislation has been had.

There are probably other legal points involved in the case, but if this opinion is adhered to by the Court it would seem to be conclusive of the case.

The suit, of which a full account was given some time since, is based upon a provision of the company's charter, which is as follows: "When the aggregate amount of dividends declared amounts to the full sum invested and 10 per cent. per annum thereon, the Legislature may so regulate the tolls of the company that not more than 15 per cent. dividends shall be declared on the capital employed, and the residue of the earnings shall be paid over to the school fund."

Davenport & St. Paul.

On the second hearing, before Judge Beck, at Madison, Ia., the Court refused to dissolve the injunction previously granted, which prohibits the company from laying its track into the city of Davenport, except on the line prescribed by the City Council.

Boston & Albany.

This company is going to establish a new cattle market along the line of the road from the shops in Allston to Brighton. A large amount of grading is required for this purpose, a hill on one portion of the land having to be cut down and the material used to fill up an adjoining swamp. The work of grading is now going on.

It is also said that the company intends to construct the projected Brighton & Newton road, which will shorten somewhat the line through those towns.

Northern Pacific—Pacific Division.

The Secretary of the Interior has directed the Government Commissioners, Messrs. Thompson, Sturgis and Ritz, to examine and report upon the 65 miles of this road now completed from the Columbia river northward toward Puget Sound.

Cairo & St. Louis.

It is reported that work on this road is now almost at a standstill, owing to legal embarrassments.

Ashburnham.

This road is now completed and in use for freight trains. It extends from Ashburnham, Mass., over the junction of the Vermont & Massachusetts and Cheshire roads, northward to Ashburnham Center, a distance of 2¾ miles. It was built mainly to carry freight to and from some large factories, but passenger trains are shortly to be put on.

Southbridge & Brookfield.

A railroad is proposed to extend from Southbridge, Mass., north to Brookfield, to connect with the proposed Worcester County Central road. The distance from Southbridge to Brookfield is 11 miles.

Missouri, Kansas & Texas.

The machine shops now at Junction City, Kan., are to be removed to Dennison, Tex., this fall. Car repair shops are also to be built at Denison.

Wisconsin Central.

Governor Washburn, of Wisconsin, recently passed over the southern end of the road to inspect the section of 40 miles last built. Trains are now running 135 miles beyond Menasha, and a large force is at work on the grading beyond the end of the track.

The company has made a formal application to the Governor for the issue of the certificates on which the patents for the land grant can be obtained. The Governor has heretofore refused to give his certificate, on the ground that the company should have commenced its road at Portage and built from that place to Steven's Point first.

Madison (Wis.) dispatches of August 17, state that the Governor has issued certificates to the company which now entitle it to half of the land granted for the construction of that road, the remainder of the grant to be given when it completes the road as called for by the grant from Portage to Stevens' Point. This action is satisfactory to the parties interested, they stipulating on the part of the Wisconsin Central Company that it will only apply for a patent for one-half of the land, unless its right to more is affirmed by the State Legislature, the Supreme Court, or other competent authority. It is understood patents will be immediately issued by the Secretary of the Interior in accordance with the above arrangment.

Erie.

This company is making good efforts to enforce the purchase of tickets at offices by passengers. Ticket agents have received orders to keep their offices open half an hour before the arrival of every train, and at intervals to call out to the passengers in the waiting-rooms that tickets *must* be purchased before taking seats in the cars. It is thought this order will have the desired effect, but should it fail to do so it is stated that a man will be placed at every car-door who will not allow people to enter the cars who do not show their tickets. It is also stated that the large returns made by conductors since the duplex ticket has been used have convinced the company that a large proportion of passengers have paid their fare in the cars, and that the loss from this source in the past has been large.

It is reported that the company is about to establish a medical bureau, which will appoint a surgeon at each principal station, who is to be called first in case of accident or need of a physician.

Four of the oldest conductors on the Eastern Division, whose terms of service varied from nine to twenty years, recently resigned on account of some new regulations. The principal objection made by the aggrieved men is that several items have been added to the conductor's report of traffic. By the addition of these items the conductor is required to report the number of local or excursion tickets not collected and the number of free passengers from whom passes are not collected. The conductors say that these instructions cannot be carried out, and that it was a matter of utter surprise to them to be called upon to make reports about matters of which they could certainly have no knowledge. The subject was brought to the attention of President Watson and the conductors found that their only course was to resign. They were all given letters of high recommendation. An additional grievance was the fact that all conductors were required to give bonds, which was taken by many of them as an imputation against their honesty.

Middletown Springs & Tinmouth.

At the last session of the Vermont Legislature a charter was granted to a company called the Middletown Springs & Tinmouth Iron & Marble Railroad Company. The road which this company purposes to build will begin at Ticonderoga, N. Y., crossing Lake Champlain on a bridge, and will run south through Orwell, Benson and Fairhaven to Poultney. Thence the line runs southeast through Middletown Springs, Tinmouth and Danby to Factory Point, from which place it will be continued by the projected West River road to Brattleboro. The length of the proposed line is about 55 miles, and it is also proposed to build a branch from Tinmouth northeast 12 miles to Rutland. It is claimed that the road will develop large deposits of iron ore and marble, and that it will form a part of a short line from New York and Boston to Montreal.

Taxes on Gross Receipts.

The following are the head notes of the decision rendered March 10 by the United States Supreme Court, in a suit between the Philadephia & Reading Railroad Company and the State of Pennsylvania. Mr. Justice Miller delivered a dissenting opinion:

"A statute of Pennsylvania that levies a tax of three-fourths

of one per cent. on the gross receipts of all railroad companies is not in conflict with the Constitution of the United States because it taxes the gross receipts, part of which may be derived from goods transferable beyond the State.

"States have authority to tax the estates, real and personal, of all their corporations, including carrying companies, precisely as they may tax similar property belonging to natural persons and to the same extent.

"All gross receipts of railroad or canal companies, after they have reached the treasury of the carrier, though they may have been derived in part from transportation of freight between States, become subject to legitimate taxation, so also do the net earnings of any corporation.

"Miller, Field and Hunt, JJ., dissent."

Panama.

It having been reported that this company proposed to make a loan of $500,000 to the Pacific Mail Steamship Company, a number of the stockholders drew up and presented to the directors a protest against any such loan, on the ground that the Pacific Mail Company was nearly bankrupt and that the security offered by it was inadequate. On the other hand a petition was presented by other stockholders requesting the directors to make the loan. Both protest and petition are regarded as being mainly stock-jobbing operations.

Osage Valley & Southern Kansas.

Suit has been brought to have this company declared bankrupt. The case came up recently before the United States District Court at Jefferson City, Mo., but was put over to the September term of court.

The road, which is leased by the Missouri Pacific, extends from Tipton, Mo., north to Boonville, 25 miles.

Leavenworth, Atchison & Northwestern.

It has been reported that negotiations were going on for the surrender of the lease of this road by the Missouri Pacific, and its sale, or lease, to the Kansas City, St. Joseph & Council Bluffs Company. The road is 21 miles long, from Leavenworth, Kan., northwest to Atchison.

Keokuk & Kansas City.

Surveys for the line from Kansas City, Mo., eastward toward Marshall were begun August 11. It is stated that the section across Saline County from Marshall to Saulsbury is ready for the iron, and that the track will be laid on it at once.

Falls City & West Virginia.

A company by this name has been organized to build a road from Falls City, Pa., which is on the Pittsburgh, Washington & Baltimore road, 75 miles southeast of Pittsburgh, southward into West Virginia.

Des Moines & Minnesota.

A dispatch from Des Moines, Iowa, says that the contract for this narrow-gauge road from Des Moines north to Ames, the crossing of the Chicago & Northwestern, a distance of about 30 miles, is to be let at once. The question of the entrance into Des Moines is postponed for the present.

Detroit, Eel River & Illinois.

This company is building a track of its own from Auburn, Ind., northward to Waterloo, a distance of five miles. It now uses the track of the Fort Wayne, Jackson & Saginaw between those points. There are rumors that the Lake Shore & Michigan Southern Company, with whose road connection is made at Waterloo, has leased or will lease the road.

Danville, Tuscola & Western.

This road is completed from Danville to Indianola, Ill., 20 miles southwest of Danville, only 15 miles of which has been built by the company, which uses five miles of the Paris & Danville track southward from Danville. From Indianola to Tuscola, 30 miles, the grading is nearly completed and the bridges are being built. It is intended to extend the road from Tuscola southwest 60 miles to Pana, the crossing of the Illinois Central and St. Louis, Alton & Terre Haute roads.

Northwestern Union.

Passenger trains are to begin running over this new line from Milwaukee to Fond du Lac September 1.

Montpelier & Wells River.

The track on the western end of this road is now laid to Marshfield, 14 miles from Montpelier. On the eastern end the track is laid from Wells River Village to South Ryegate, seven miles.

Walla Walla & Columbia River.

The bridges on this road are being put up and tracklaying is actually begun. The road will extend from Walla Walla, Oregon, westward to the Columbia River at Wallula, a distance of about 30 miles.

Pittsburgh, Wheeling & Kentucky.

The grading on several of the sections is completed and that on others is being rapidly finished. It is expected that the grading will be substantially complete by the end of September.

Union Depot at St. Paul.

A new union depot was recently completed in St. Paul, Minn., and trains commenced to run into it August 18. It is used by the St. Paul & Pacific, West Wisconsin and St. Paul, Stillwater & Taylor's Falls roads and will probably be soon used by the Lake Superior & Mississippi trains also. The depot is described as being extensive, convenient and well fitted up.

Pacific of Missouri.

The track on Poplar street in St. Louis, which connects this road with the levee and which has long been a subject of controversy, was broken, August 11, by the city authorities under an ordinance passed by the city council a month previously. The track was broken by taking up the rails at every cross street. Much indignation is expressed at this action by St. Louis merchants, as the company is now unable to run its cars to the elevators or to transfer freight directly to boats.

Subsequently the Atlantic & Pacific and Missouri Pacific companies commenced suit against the city authorities for $100,000 damages.

St. Louis & St. Joseph.

Holders of this company's first-mortgage bonds are invited to communicate with Turner Brothers, No. 14 Nassau street, New York.

Northern Pacific.

General Rosser, the Engineer in charge of the surveys, has submitted his official report to the company. He finds the new and final route across Western Dakota, from the Missouri to the Yellowstone River, entirely practicable and satisfactory, it being greatly superior to those of former surveys. The distance, 205 miles, is 21 miles shorter than the survey of 1871. The grades are moderate. The average of work per mile is considerably less, and the number of important bridges is reduced nearly two-thirds. The Little Missouri River, which former surveys crossed seven and eleven times, is crossed once. On the line so located the route runs immediately through only one mile of bad clay lands, just east of the Little Missouri. With a few exceptions the country is a rolling prairie, sometimes rising into low hills, the grass being excellent and the soil good. Good water was found the entire distance. Coal outcrops at various points in veins several feet in thickness, and timber is more abundant than on former routes. The report states that the main body of General Stanley's expedition, and most of the press correspondents, accompanied the scientific corps, and did not accompany the engineers. The former were escorted by General Custer's detachment, and followed the old, abandoned route south of Heart River, hence descriptions of the region traversed by the main command do not apply to the country traversed by the new route nor the railroad.

The directors of the company have accepted the new line recommended by General Rosser, from Bismarck, the present end of the track, to the Yellowstone crossing. The company advertises for sealed proposals for grading and bridging the line from Bismarck to the Yellowstone River, 205 miles. Proposals will be received for the whole distance or for sections of about 25 miles each. Information as to the line, etc., can be obtained at the office of W. Milnor Roberts, Chief Engineer, No. 23 Fifth avenue, New York, or from Gen. T. L. Rosser, Division Engineer, at Minneapolis, Minn. Proposals will be received at the office of the Chief Engineer up to September 10.

The expedition is now prosecuting its survey westward up the left bank of the Yellowstone to Pompey's Pillar, where it will join the survey made last year from the west, and thus complete the surveyed line across the continent. The entire command is expected to return to Fort Rice about October 1.

This company advertises that of $9,000,000 of its 7-30 bonds unsold June 1 less than $5,000,000 remains.

Eastern.

This company has now two anthracite-burning locomotives, which are said to give good results. Fuel must be imported for the road and the comparative cost of anthracite from Pennsylvania and bituminous from Nova Scotia and the Cumberland mines is likely to determine which of these fuels shall be used on most New England roads.

Kansas Pacific.

Adolphus Meier, Trustee for the bondholders, will receive proposals until noon of August 23, for the sale to him of $25,000 of this company's first-mortgage bonds, land-grant bonds and Denver Extension bonds, for the sinking fund.

Harlem River & Port Chester.

The New York, New Haven & Hartford Railroad Company, which has a property which at market rates for its stock is worth more than $20,000,000, while its debt is about $1,000,000, has guaranteed an issue of $2,000,000 of the 7 per cent. bonds of the Harlem River & Port Chester Company (whose road the first-named company has consented to lease), and will now receive sealed proposals for these bonds until September 15, through its Treasurer, Mr. John T. Shelton, at the Grand Central Depot, New York. The guarantee of the New Haven Company is probably as strong as any American company could offer, and the bonds will probably sell at a considerable premium. The New York Central bonds lately sold to bidders are now advertised by banking houses at 105.

St. Paul & Pacific.

A dispatch from Dubuque, Ia., under the date of August 14, says:

"J. P. Farley, lately appointed Receiver of the St. Paul & Pacific Railroad, returned last night from St. Paul, where he had gone to make his necessary qualifications and look after the interests of the company. He says nothing can be done at present. The directors are very sanguine that the Holland capitalists, who have already expended $10,000,000 on the road, will furnish $5,000,000, the amount required to finish it. The agent in New York has written to Holland, and expects an answer by the 17th inst."

The St. Paul (Minn.) *Press* says that Colonel De Graff, who had the contract for building both these lines, that to Brainerd and the St. Vincent extension, has made all the necessary preparations and is ready to recommence work at once as soon as he receives orders. He is confident that the work can be completed by December, in time to save the land grant.

We are informed by New York parties interested that the Dutch bondholders have determined to advance the money necessary to complete the road, and probably work will have been resumed by the time this paper appears.

Texas & Pacific.

Track has been laid on the line from Jefferson, Texas, to Texarkana, where the connection with the Cairo & Fulton road is to be made, for nine miles, from Jefferson to Monterey.

Northern of Canada.

At the semi-annual meeting in Toronto, August 13, it was reported that $56,722.45 had been expended in new construction during the half year. The Dominion Parliament having appropriated $35,000 in aid of the reconstruction and improvement of Collingwood harbor, conditional upon a like sum being jointly appropriated thereto by the town of Collingwood and the company in equal proportions, preliminary arrangements have been completed and the works will at once be proceeded with. The line of the Northern Extension road has been completed to Washago, making in all 54.85 miles of that line in operation. The Northern Company now operates 195 miles of road, including its own and the Northern Extension lines.

Lafayette, Muncie & Bloomington.

It is stated that Mr. Earl, President of this company, has effected an arrangement with New York parties by which mortgage bonds to the amount of $20,000 per mile are to be issued on the road between Lafayette and Muncie. These bonds will be taken on condition that all pending suits against this company are abandoned. To effect this, Mr. Earl has resigned his position as President, and it is probable that the whole board will resign and a new board be elected.

Dakota Southern.

Suit has been commenced in the District Court at Yankton, Dakota, to restrain this company from making a proposed issue of $1,200,000 mortgage bonds, and also to compel the company to present a statement of its affairs to the stockholders. It was claimed that the issue of bonds was part of a plan by which the present stock was to be wiped out and the road turned over to the bondholders. After hearing arguments, the Court decided to enjoin the company from encumbering the road with bonds or mortgages, and also decided that all stockholders should be held responsible for the amount of stock subscribed, and that the plaintiffs could insist upon such owners of stock paying the same as Yankton County had done. A statement of the construction company, which has operated the road since it was finished, setting forth the earnings and disbursements, must also be made for the scrutiny of stockholders.

International Bridge.

The river piers for this bridge across the Niagara at Buffalo have all been completed except one. In preparing for this last pier it was found that the river bed was covered with some 10 feet of gravel, which it was necessary to remove. The removal has been completed and work begun on the foundation of the pier. It is expected that it will be finished in about four weeks.

The bridge across the main river will be 1,968 feet long. Beginning at the Canada shore, there will be three spans of 190 feet clear, then three spans of 240 feet, then the draw span, which will have two clear openings of 160 feet each, then another span of 190 feet will bring the bridge to Squaw Island. Across the island the distance is about 1,200 feet, and then there is another bridge across Black Rock Harbor 517 feet long. In this last bridge there is a draw span with two clear openings of 90 feet each.

The superstructure will be the Pratt truss and is being built at the Phœnixville Bridge Works. A novel plan is pursued in placing the iron spans upon the piers. They are built upon a framework over a number of pontoons, which act in the manner of a dry dock. The pontoons are carefully dropped between the piers, and when in position water is let into them, and the iron truss is settled into its exact place on the piers.

The Grand Trunk, Great Western, and Canada Southern railways have already put down approaches to the bridge on the Canada side. On the Buffalo side several tracks have been laid on the approaches, including one belonging to the New York, West Shore & Chicago.

New York & Canada.

The work on the Southern Division of this road from Whitehall, N. Y., northward 24 miles to Ticonderoga, has been somewhat delayed by failure of contractors, but the work is now in good hands and is progressing well. On this section the work is difficult, there being much rock cutting and a large amount of filling in on the lake shore. A tunnel 930 feet long is being cut through at Ticonderoga. From Ticonderoga to Port Henry, 17 miles, the Southern Division of the Whitehall & Plattsburg road is used, and is already in operation. From Port Henry north to Plattsburg, 50 miles, all the heavy work, including two tunnels, one 300 and one 800 feet long, has been let, and work has just begun. On this division also there is much heavy work; in fact the work is all heavy with the exception of some miles south of Plattsburg. The light work will be let in the spring, and it is intended to have the line open to Plattsburg in the fall of 1874. The Northern Division of the Whitehall & Plattsburg road, from Plattsburg southward to the Au Sable River, which, with the Southern Division, is now owned by the New York & Canada Company, will not be used as part of the main line but will be operated as a branch. From Plattsburg north to Rouse's Point, where connection will be made with the Grand Trunk Railway, the distance will be about 12 miles, on which work has not yet been begun.

The road is being built in the interest of the Delaware & Hudson Canal Company, and will form, in connection with the Rensselaer & Saratoga road, which is leased by that company, a new and very direct line for business from New York to Montreal.

Contracts.

Col. N. Macomb, the engineer officer in charge, at his office in Rock Island, Ill., August 22, opened the bids for putting in the bottom or foundation for the locks at Copperas Creek on the Illinois River Improvement. The aggregate of the several bids were as follows: W. Johnson, Fulton, N. Y., $73,450; D. J. Jenne, Sterling, Ill., $75,930; James Lake, Chicago, $76,080; N. A. Brison, St. Louis, $77,560; Thomas Saulpaugh, Rock Island, $81,942; M. Haley & Co., Chicago, $88,730. The contract was not awarded, as the papers must first be sent to Washington.

Col. William Merrill, the Engineer officer in charge of the Ohio River Improvement, at his office in Cincinnati, August 12, opened the bids for the construction of a steamboat lock in the Monongahela River. There were twelve bids, the lowest, that of Smith, Hawkins & Davis, being $54,600, and the highest, $123,400. The contract has not yet been awarded.

Des Moines Rapids Improvement.

The last stone of the middle lock on the Des Moines Rapids Improvement at Keokuk, Iowa, was laid with much ceremony August 11. This is the first portion of the improvement completed. The lock contains 9,400 cubic yards of cut stone masonry, 940 cubic yards of rubble stone masonry, and 1,520 cubic yards of concrete masonry. It is 489 feet long, and 80 feet wide. Its capacity for vessels is 350x80 feet. It has eight feet lift, and vessels drawing five feet can pass through it in low water. The work was commenced May 17, 1871, and has cost about $260,000.

St. Joseph & Denver City.

The Protection Committee, appointed at a former meeting of bondholders of this company, request a meeting of the bondholders at the office of Hassler & Co., No. 7 Wall street, New York, at one o'clock on Tuesday, August 26, for the purpose of receiving the report of the Committee. Bondholders not able to attend are asked to authorize some one to represent them, as matters of importance will come before the meeting.

Owners of bonds are requested to communicate with the Protection Committee, stating the amounts of their bonds and whether white (Eastern Division) or yellow (Western Division). All letters intended for the Committee should be addressed to Charles W. Hassler, Chairman, care of Hassler & Co.

California & Texas Construction Company.

It is reported that this company, which is building the Texas & Pacific Railway, has made a further assessment of 10 per cent. on its stock, making 75 per cent. in all on a total capital of $10,000,000, which ought to be enough to complete the track for 300 miles of road over such country as it is working in. But it will probably complete much more than that before very large proceeds are had from sales of bonds, which, however, ought to be encouraged by the knowledge that so much money has been put into the road before it is mortgaged. Stockholders, however, who took this construction company to be another Credit Mobilier, whose shares were not to be paid for but to pay endless dividends in cash and bonds and shares, are doubtless very much disgusted to find that they must invest some money before they can get any profits.

Dividends.

The Chicago & Alton will pay the usual half-yearly dividend of 5 per cent. September 5. Transfer books will be closed August 22 and reopened September 11.

Adams Express Company will pay a dividend of 2 per cent. September 1. Transfer books were closed August 18 and will be reopened September 2.

The Chicago, Burlington & Quincy pays its usual half-yearly dividend of 5 per cent. September 15.

The quarterly dividend of 1¾ per cent. on the new guaranteed stock of the Cleveland & Pittsburgh Railroad Company will be paid at the office of the Farmers' Loan & Trust Company, New York, September 1. Transfer books will be reopened the next day.

Baltimore & Ohio.

It is reported that this company is preparing to remove its passenger depot in Washington.

Laurens & Asheville.

South Carolina papers report that this new company has purchased the old Laurens Railroad, which extends from Newberry, S. C., on the Greenville & Columbia road, northwest to Laurensville, 32 miles. This road is to be put in good repair, and is to form the southern portion of the Laurens & Asheville line.

Atlantic & Pacific.

The office of Assistant General Superintendent on this road and its leased lines has been abolished. In future employees will report directly to heads of departments, and the latter will report to and receive instructions from the General Superintendent.

Lynchburg & Clifton Forge.

The engineers of the Chesapeake & Ohio Company have been making an examination of this proposed line, which is to run from Clifton Forge, Va., which is on the Chesapeake & Ohio, 190 miles from Richmond, down the valley of the James to Lynchburg. It is stated that the road can be constructed at a reasonable cost and with grades not over 80 feet to the mile;

its length would be about 55 miles. The surveys are to be continued from Lynchburg eastward in the direction of Norfolk.

It is also purposed to build from Lynchburg eastward down the valley of the James to Richmond, and meetings have been held to further this object.

Petersburg.

It is reported that the parties who lately made application to the Virginia courts for the removal of President Ragland, of the Petersburg Railroad Company and the appointment of a receiver, have abandoned their case, and it stands postponed indefinitely.

Bangor & Calais Shore Line.

The city of Castine, Me., has voted an appropriation to pay the expenses of the survey of the road to that city.

South St. Louis & Belleville.

A company has been organized to build a railroad from Belleville, Ill., west by north to the Mississippi, opposite Carondelet. There is also to be a branch to connect with the Cairo & St. Louis road. The line from Belleville to the river will be about 15 miles long.

Central of Iowa.

It is stated that this company has stopped running passenger trains to Albia, Iowa, the southern terminus of its line. All passenger trains to pass to the Des Moines Valley road at Eddyville, 14 miles north of Albia, and run over the latter road to Ottumwa. The mail and passengers to Albia are carried from Eddyville by freight trains. This shortens the distance materially, as Eddyville is but 16 miles from Ottumwa, by which both the Chicago and the St. Louis traffic of the road goes; while Albia is 25 miles from Ottumwa, and business going through it goes 23 miles out of its way.

Milwaukee & Northern.

Appleton, Wis., voted August 12 the $50,000 asked for in aid of the extension of the Menasha Branch to that city.

Washington, Cincinnati & St. Louis.

Ground was broken on this narrow-gauge road at Bridgewater, Va., August 11, by the contractors. Work will commence at Harrisonburg in a few days.

Lawrence & Southwestern.

It is reported that the Leavenworth, Lawrence & Galveston Company has bought this road, which now extends from Lawrence, Kan., southwestward 32 miles to Carbondale. It is also reported that it is to be extended beyond Carbondale.

Savannah & Memphis.

The Columbus (Ga.) *Sun*, of recent date, says:

"The Mobile & Ohio and the St. Louis & Iron Mountain have guaranteed the interest on the bonds of the Savannah & Memphis Railroad Company, and have also made a traffic agreement by which the three roads take $50,000 per annum of the Savannah & Memphis bonds for three years after the latter road is completed."

The road is to extend from Opelika, Ala., northwest to Corinth, Miss., where connection will be made with the Mobile & Ohio and Memphis & Charleston roads, and will be about 250 miles long. It is now in operation from Opelika to Shirdevant, 40 miles.

Minneapolis & St. Paul.

A company has been organized to build a railroad between these two Minnesota cities, which are about 11 miles apart. It appears to be the design of the company to build a light road to be operated with dummy engines.

Peach Bottom.

The Oxford (Pa.) *Press* of recent date says:

"It is the expectation of the managers of the road to begin to lay the track next month. We understand the iron for the entire line to the river has already been purchased. The erection of the bridge over the Octorara Creek near Pine Grove has been commenced. The mason work of numerous other bridges and culverts is finished, and the grading as far west as Fulton House, with the exception of some heavy work at Clendenin's summit, is nearly completed."

Northeast Pennsylvania.

The North Pennsylvania Company, which owns this road, has nearly completed an extension from the present terminus at Hatboro, Pa., northeast some three miles into Bucks County.

New Haven, Middletown & Willimantic.

A statement of the present condition of this railroad shows that it is held by O. V. Coffin and W. R. Galpin as trustees, on account of a mortgage deed, and that they are not disposed to interfere with the work on the road, or the officers or parties to the contracts already made, so long as the work is progressing, and therefore the old officers have remained in charge of the unfinished section. No other parties in interest can obtain possession of the road, except the first-mortgage bondholders, and they cannot under five years.

New York & Oswego Midland.

Freight trains are now running through from Oswego to Jersey City. No notice of the formal opening of the road has yet been given. The company has established its freight depot in New York, at Pier 23, North River.

The work of relaying the track on the Utica & Rome Division, between New Hartford and Clinton, has been commenced. The old rail, which was light, is being replaced by heavier iron, with fish joints.

Through passenger trains from New York to Oswego were put on the road August 18. Two trains are run, the through mail, which leaves New York at 7.50 a.m., arriving at Oswego 11.15 p.m., and at Utica 9.40 p.m., and the Ontario express, which leaves New York 6.30 p.m., and arrives at Oswego 8 a.m., and at Utica 7 a.m. The express train both ways is run to Pompton Junction over the Montclair Division. The distance from New York to Oswego is 333 miles, or eight miles more than by the existing line of the Delaware, Lackawanna & Western Company, which is 325 miles long.

Montrose.

It is stated that work on this road, which was completed last December from Tunkhannock, Pa. (on the Pennsylvania & New York road), north about 24 miles to a point about three miles from Montrose, has been stopped for want of funds. An effort is being made to raise money to complete it.

South Side, of Long Island.

The track is being put in complete order, and the depots along the line are being renewed and improved. The company has added 15 passenger and 25 freight cars to the equipment. It is reported that the terminus of the road is to be changed from South Eighth street, Williamsburgh, to Hunter's Point.

Burlington & Southwestern.

The Keokuk (Ia.) *Gate City* of August 13, says: "The action of the St. Louis, Kansas City & Northern Company in refusing the Burlington & Southwestern the further use of its track between Moulton and Bloomfield is reported to have been occasioned by the failure of the latter to pay $20,000 due the first named, for the use of said track. Trains on the Burlington & Southwestern have not been entirely suspended. They are now running on their own line at both ends, and transferring everything at Moulton and Bloomfield, and paying the regular rates for passengers and freight over that road. We understand that provisions have been made for the payment of the required sum, and that through trains will be running regularly in a short time."

It is stated that a contract has been made with E. B. Ward, of Detroit, Mich., for the speedy completion of the road from Unionville, Mo., southwest to Sandy Hill, the point where a junction is to be made with the St. Louis, Kansas City & Northern road for Kansas City.

Savannah & Charleston.

South Carolina papers report that negotiations are going on which will probably result in the purchase of a controlling interest in this road by the Georgia Railroad Company. The control of this road will give the Georgia Company, which already controls the Port Royal Railroad, a line of its own from Augusta to both Charleston and Savannah, making it independent of both the South Carolina and Georgia Central. From Augusta to Charleston by the Port Royal and Savannah & Charleston roads is 139 miles, against 137 miles by the South Carolina road, and from Augusta to Savannah the distance is 137 miles, against 132 by the Central of Georgia.

New Jersey Midland.

This company has filed with the Secretary of State at Trenton, N. J., the surveys of a part of its new branch or extension from Ogdensburg, N. J., to Belvidere, which, we believe, is to be built under the general railroad law. The surveys are still going on. The line crosses the Pequest about a mile above Belvidere and thence passes up Beaver Brook, passing underneath the Delaware, Lackawanna & Western near Hope. Another line is to be surveyed running up the Pequest to Danville and thence by Green's Pond and the Kishpaugh Mine. Mr. G. H. Munson is the Engineer in charge of the surveys.

Montclair.

Messrs. Loomis, Wicks and Jordan, the trustees and receivers now in possession of this road, state that they are preparing an exact statement of the present condition and indebtedness of the company, which will shortly be made public. The New York & Oswego Midland Company continues to operate the road under temporary agreement.

Pennsylvania—Amboy Division.

Over one hundred men have lately been discharged from the shops at Bordentown, N. J., and it is reported that the shops are to be closed entirely, which seems somewhat improbable.

Camden & Bordentown.

Articles of association have been filed with the Secretary of State of New Jersey by a company which purposes to build a railroad from Camden, N. J., northwest to Bordentown, a distance of 23 miles. The capital stock is to be $1,000,000. The road, which is probably intended to connect with that of the company recently organized to build from South Amboy to Bordentown, must be parallel and close to the old line of the Camden & Amboy.

Fredericksburg, Orange & Charlottesville.

Work on this road is progressing between Parker's and Orange Court House, Va., and the company now expects to complete it to the latter point by December 1.

National.

The Elizabeth (N. J.) *Journal* of a recent date says:

"It will be remembered that one of the conditions precedent on which a certain combination of English capitalists would take hold of the National Railroad enterprise was, that the outstanding claims of contractors and others should be settled and the road turned over to them clear and free. It appears that the limit of time within which the Hamilton or 'New York' party in the National management promised to settle their old debts, expired on Saturday last (August 9), without their having accomplished it, and rather than let the Englishmen's offer lapse by default, the Case or 'Philadelphia' party (who notwithstanding that they have been overslaughed and beaten by the 'Hamilton' party in the management, yet contribute about all the real capital there is in the concern) have come to the rescue and agreed to see the road out of the woods as to these claims, on which an injunction by bankruptcy has been threatened."

Iron Mountain, Chester & Eastern.

At a meeting held in St. Louis, August 13, the directors voted to authorize an issue of $3,000,000 consolidated mortgage bonds, the proceeds of which are to be used in completing the Missouri section of the road, from Chester to Iron Mountain, 60 miles.

Illinois, Missouri & Texas.

Blyth & Co., of London, were offering an issue of $1,500,000 of this company's 7 per cent. bonds at £175 for a bond of $1,000 on the 23d ult.

Missouri, Kansas & Texas.

Amsterdam dates of July 24 say that some excitement existed there because of the appearance of bonds of this company numbered higher than 14,000, when it had been announced that the company's bonded debt amounted to but $14,000,000 in 14,000 bonds of $1,000 each. It had been explained that the higher numbers were issued on the Tebo & Neosho Railroad when that was consolidated. A committee of the Stock Exchange had made a report announcing that bonds numbered 14,001 and higher would not be a good delivery, and the bonds had fallen two or three points. They seem to have recovered, however, by the last quotations.

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Atlantic & Gulf.

This company owns a line 237 miles long from Savannah to Bainbridge, Ga., with an extension two miles in length from the depot in Savannah to the river; a branch from Lawton, Ga., south to Live Oak, Fla., 48 miles, and a branch from Thomasville, Ga., north to Albany, 60 miles, making in all 347 miles of road.

The receipts for the year 1873 were as follows:

Passengers	$201,707 10
Freight	729,512 44
Mails	21,730 20
Incidental	31,026 59
Total ($2,836 per mile)	$983,966 06
Operating expenses (65½ per cent.)	644,426 59
Net earnings ($978 per mile)	$339,539 47
Extraordinary expenses	25,821 69
Surplus	$313,717 78

As compared with the previous year there was a decrease of 5 per cent. in gross earnings, a decrease of 8 per cent. in operating expenses and a decrease of 2⅞ per cent. in net earnings.

The decrease in earnings as above shown arose in the business of the first three months of the year, which was $72,555.65 less than for the same period in 1871. The cotton receipts for the same period were 43,269 bales less than in 1871. So that with a decrease of 64 per cent. in cotton receipts, there was a decrease of 21 per cent. in the earnings of the road from January 1 to March 31, at which date the business season may be said to terminate.

The business of the summer months showed a decided improvement—being, from July to September (inclusive) $20,000 in excess of that of the same period in 1871; but another short cotton crop rendered the fall business of 1872 even less profitable than that of the previous year.

Other causes have tended to diminish the receipts of the year just expired. The railroad connections in Florida have been in a disorganized condition for nearly the entire year; while the fall season opened with a rivalry among the lines carrying freights from New York to competing points in the South that forced down the rates on such business below the cost of performing the service. The business of the Chattahoochee River has been diverted from the road to a considerable extent, by the opening of the new route from Eufaula through Montgomery to Louisville.

The principal items of freight were cotton, of which 124,041 bales were carried, a decrease of 12,916 bales, or 9½ per cent., from 1871; and lumber, of which the road carried 46,443,722 feet, an increase of 11,443,881 feet, or 31⅛ per cent., over 1871.

The total mileage of engines during the year was 635,350 miles. The mileage made by passenger cars was 1,600,410 miles; by freight cars, 5,009,454 miles; and by road and service cars, 545,781 miles. Freight cars of other companies also made over the road a mileage of 618,019 miles.

The cost of maintenance of way was $175,271.05, and, in addition, $15,499.58 was expended on the Savannah River extension and wharf and side track to the cotton presses in Savannah. The bridges over the Little and Great Ogechee and the Altamaha rivers have been thoroughly repaired, and 3,118 feet of trestle bridging and 80 timber abutments have been entirely removed.

Two passenger and 15 platform cars have been built to replace old cars condemned, and six new platform cars and one log truck have been built. The equipment of the road now consists of 26 locomotives, 19 passenger, 3 baggage, 3 mail and express, 219 box, 11 stock, 107 platform cars, 1 log truck, and 4 road or service cars.

The total cost of locomotive service, excluding wages of enginemen and firemen, was $86,469.23, an average of 13.6 cents per mile.

Georgia.

This company's road extends from Augusta, Ga., westward to Atlanta, 171 miles, with branches from Barnett north to Washington, 18 miles, and from Union Point northwest to Athens, 39 miles, making a total of 228 miles. The company also leases and operates the Macon & Augusta road, from Camak southwest to Macon, 78 miles, the accounts of which are, however, stated separately.

The operations of the road for the year ending March 31, 1873, were as follows:

Receipts:		
From passengers		$375,339 26
Freight		1,222,788 63
Mails		25,328 64
Gross earnings ($7,120 per mile)		$1,623,455 53
Expenses:		
Conducting transportation	$253,115 54	
Motive power	327,066 60	
Maintenance of way	316,999 43	
Maintenance of cars	79,649 34	
New buildings	13,247 00	
New equipment	143,182 84	
Total expenses (69⅞ per cent.)		1,133,260 75
Net earnings ($2,150 per mile)		$490,195 78

As compared with the previous year, there was an increase of gross earnings of $289,444 21, or 21½ per cent., and an increase in net earnings of $81,964.94, or 20⅛ per cent. The increase in receipts was almost entirely from freight, the increase in passenger earnings being only $6,700.87. The number of bales of cotton carried during the year was 294,300, an increase over the previous year of 131,839, or 81½ per cent. The income from business received from connecting roads at Atlanta was $473,372.10, a little over one fourth of which was on business coming from the Western & Atlantic road, and nearly one-half from freights from Nashville and places beyond. The Superintendent's report says of Western freights:

"It is a misapprehension to suppose that most of the western business comes directly to the local stations on the line of your road, and therefore its prompt movement is not quite as important as if it passed over your entire road to Augusta, or some *other competing point*. The reverse of this is true; last year the Georgia Railroad's proportion of western business proper from and to connecting roads west to and from Augusta and points east, was more than four times as much as that received by connecting roads west to and from local stations. In addition, however, to the revenue derived by your company from its proportion of the through rate to Augusta, a large proportion of the freights are returned over your road to local stations, upon which the local tariff is charged; but upon the through rates even, I am persuaded that we receive remunerative compensation. Upon investigation we find, that on an average, the Georgia Railroad receives about $56.66 per carload of ten tons, or over two cents per ton per mile, on all freight shipped from Nashville, and from more distant points in the West to Augusta. When it passes through Augusta to points of greater competition, your road's proportion is something less. On all freights shipped from points south of Nashville, the proportion of the Georgia Railroad is considerably more than stated above."

During the year there has been put into the road 29⅞ miles of new and rerolled iron and 8⅝ miles of iron repaired in the company's shop. On the main line 93,114 new ties have been put in, and on the Athens Branch 11,617. About 40 miles of new and rerolled iron is needed the present year.

During the year 2 passenger, 3 baggage, 50 box, 45 flat and 5 coal cars have been added to the equipment, which now consists of 56 locomotives, 27 passenger, 11 baggage, 6 mail and express, 449 box, 13 caboose, 135 flat, 35 stock, 28 coal, 20 "shanty" and 2 wood cars, a total of 44 passenger-train cars, 660 freight-train cars and 22 road or service cars. Of the locomotives four are old and will soon have to be condemned. Some additions to the freight locomotives will soon be required, but the most pressing need is for some light engines for accommodation trains and for service on the branch roads. An increase of 200 box cars will be required during the present year. The total mileage of locomotives during the year was 1,103,551, an increase of 132,501 miles, or 14 per cent.

The operations of the Macon & Augusta road, which are given separately, were:

Earnings:		
From passengers		$39,399 45
Freight		77,458 64
Mails		3,900 00
Gross earnings ($1,549 per mile)		$120,758 09
Expenses:		
Conducting transportation	$28,695 82	
Motive power	33,804 50	
Maintenance of way	49,727 52	
Maintenance of cars	1,039 76	
Total expenses (93¾ per cent.)		113,267 60
Net earnings ($96 per mile)		$7,490 49

There was an increase in receipts over the previous year of $26,628.07, or 28⅜ per cent.

The capital stock of the Georgia Railroad Company is now $4,200,000 and the bonded debt $676,500, making a total fixed capital account of $4,876,500, or $21,388 per mile. The company owns $834,891.67 in stock and $151,560 in bonds of various railroad companies and $45,000 in stock of steamship companies.